GE Fanuc Automation

Programmable Control Products

Mini Operator Interface Terminal

User's Manual

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Content of this Manual

This manual consists of 6 chapters each of which is summarized below.

Chapter 1. Introduction: This chapter provides a general overview of the features and operation of the Mini OIT. Specifications of the Mini OIT are included.

Chapter 2. Getting Started: This chapter is a step–by–step tutorial on how to start up the Mini OIT and perform basic operations. The chapter describes basic OptiSCREEN file editing using numerous examples.

Chapter 3. Installation: This chapter describes in detail how to connect AC power, connect the battery, make communication cables, and install memory.

Chapter 4. Operation: This chapter explains in detail how to operate the Mini OIT. It includes sections on Mini OIT configuration, keyboard operation, and OptiSCREEN Editor operations.

Chapter 5. OptiSCREEN Command Reference: This chapter describes each OptiSCREEN command in detail.

Chapter 6. Utility Programs for the IBM PC: This chapter describes how to use the utility programs, provided on diskette, which aid in the development of application programs and screens.

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Appendix B. ASCII Codes and Special Character Sets

Appendix C. Screen Programming Template

Appendix D. ANSI Escape Sequences for PLCs

Appendix E. VT52 Escape Sequences

Appendix F. Function Key Operations

Appendix G. STR–LINK III Communications Protocol

Related Publications

- GEK–25398 *Series Six™ Programmable Controller ASCII/BASIC Module User's Manual*
- GEK–0269 *Series Five™ Programmable Controller ASCII/BASIC Module User's Manual*
- GFK–0249 *Series One™ Programmable Controller ASCII/BASIC Module User's Manual*
- GFK–0255 *Series 90™ Programmable Controller PCM User's Manual*

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Chapter 1 Introduction

The Mini Operator Interface Terminal (Mini OIT) is a rugged, compact, conversational terminal specifically built for use as an operator's console. It is intended for use with a wide variety of intelligent, industrial machines that are capable of communication over a serial or parallel interface. These industrial machines may be host computers, CNC systems, programmable controllers, robots, and other computer-based data acquisition, monitoring, and control systems. In this publication, however, the intelligent machine described will be a Programmable Logic Controller (PLC) such as the Series One™, Series Five™, Series Six™, Series 90™-70, or Series 90-30 PLC from GE Fanuc Automation.

This chapter provides an overview of the Mini OIT. The topics covered are:

- Features of the Mini OIT
- General System Operation
- Feature Comparison with Other GE Fanuc OIT Models
- Keyboards for the Mini OIT
- Specifications

Features of the Mini OIT

The compact size and rugged nature of the Mini OIT makes it ideal for factory floor applications. The Mini OIT comes in two models, the standard Mini OIT (IC600KD515) and the Mini OIT-Touch (IC600KD516) which includes touch screen capability. The Mini OIT operates using either the ANSI X3.64, the VT-100 or the VT-52 escape sequences. This means the Mini OIT can replace many terminals which also use these escape sequences such as the DEC VT-100 and VT-220. See the illustration of the Mini OIT below.

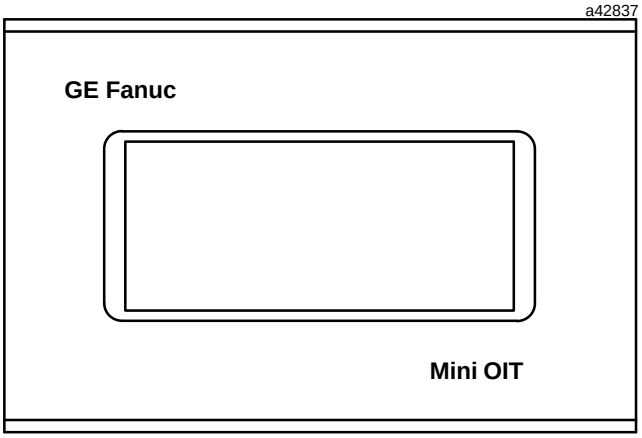


Figure 1-1. The Mini OIT

Other important features of the Mini OIT are described below.

- **Size:** The Mini OIT is very compact yet capable of displaying up to 16 lines of 80 characters each.
- **OptiSCREEN Editor:** The OptiSCREEN Editor allows you to create screens easily using English language commands.
- **Touch Screen Capability:** If the Mini OIT is equipped with the touch screen option (Mini OIT-Touch), the OptiSCREEN Editor can create touch boxes which are displayed on the screen to be used for operator inputs.
- **Serial and Parallel Interface:** There are two ports on the Mini OIT; 1 serial port and 1 parallel port. The serial port is used to connect to a host such as a Series 90-70 PLC through the Programmable Coprocessor Module (PCM). The parallel port can be connected directly to the I/O of a PLC for data transfer.
- **Configuration Screen:** All communications parameters and terminal set up is done through an easy-to-use menu on the Configuration Screen
- **Keyboards:** GE Fanuc offers a NEMA 4, full ASCII sealed keyboard for use with the Mini OIT. There is a DIN connector on the back of the unit for the standard IBM PC-XT keyboard which can also be used.

General Operation of the Mini OIT

The Mini OIT is designed to receive dynamic (changing) information from the host computer (PLC) and display it on the screen in a user-programmed screen format. This format is created using the OptiSCREEN Editor and typically does not change as often as the dynamic information from the PLC. The operator can enter data and initiate action to be taken by the PLC by pressing programmed touch keys on the screen or by pressing keys on an attached keyboard.

The information displayed on the Mini OIT is of two types.

- Dynamic information such as counter or timer values from the PLC.
- Screen format programmed using the OptiSCREEN Editor which makes the dynamic information easy to read.

Creating the Screen Format

The OptiSCREEN Editor allows you to create screen formats easily, using English-language commands instead of the cumbersome escape sequences required on some terminals. The screen format usually consists of the screen title, explanations of the dynamic data, and any graphics such as lines and boxes used to clearly present the data.

The figure below illustrates a typical screen format.

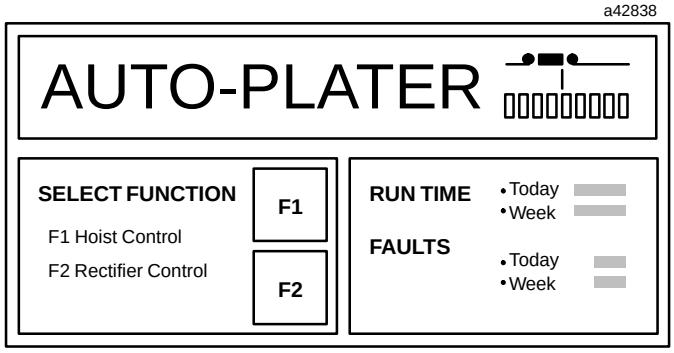


Figure 1-2. Typical Screen Format Created Using the OptiSCREEN Editor

Transferring Data Between the Host (PLC) and the Mini OIT

The Mini OIT features two separate ways in which to connect the Mini OIT to the PLC:

- Through the Serial Port to a BASIC language processing module (such as the PCM or ASCII / BASIC module) in the PLC.
- Through the Parallel Port directly to 5 V TTL I / O modules of the PLC.

These methods for transferring data are described very briefly below. Refer to later chapters for more details.

Transferring Data Through the Serial Port

The serial port includes an RS-232 or an RS-422 interface which can be connected to an intelligent module such as the ASCII / BASIC module. This module runs the BASIC programming language which can acquire data from the PLC, manipulate it if necessary, and transfer it to the Mini OIT so it can be displayed in the applicable screen format. The ASCII / BASIC module also retrieves operator-entered data and key presses to be acted upon by the PLC.

The figures below show the connections for a serial configuration using the Mini OIT and for the Mini OIT-Touch.

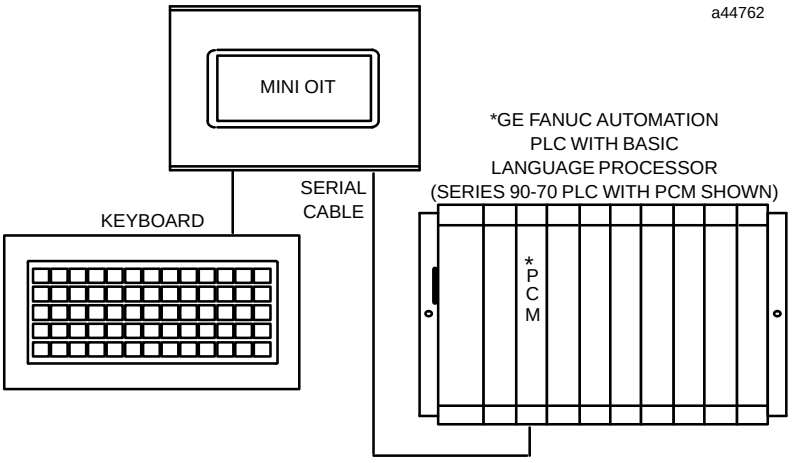


Figure 1-3. Connecting the Mini OIT to a PLC through the Serial Port

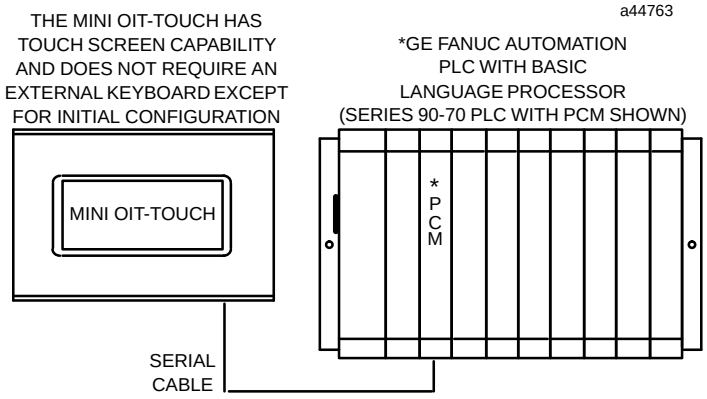


Figure 1-4. Connecting the Mini OIT-Touch to a PLC through the Serial Port

Transferring data through the Parallel Port.

Some operations require only the display of data by the PLC, and do not require operator input. For this type of application, the parallel port can be configured in "Easy Display Mode" which makes this easy to do.

In Easy Display Mode the parallel port is connected directly to 5 V TTL output modules of the PLC. The ladder program in the PLC performs any necessary manipulations or calculations with the data (instead of an ASCII/BASIC module) and then sends the data directly through the output modules to the Mini OIT. The figure below shows how this system would be connected together.

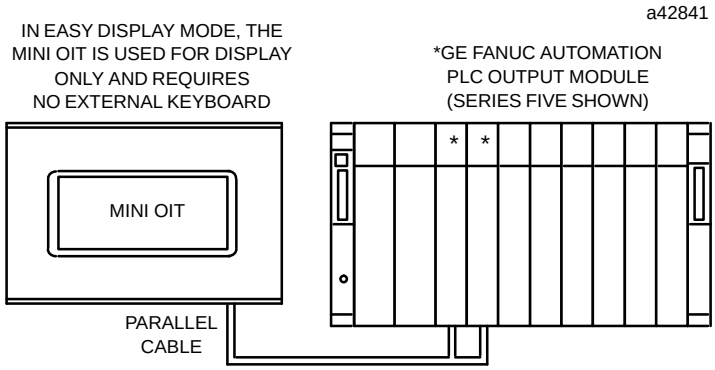

a42841
IN EASY DISPLAY MODE, THE MINI OIT IS USED FOR DISPLAY ONLY AND REQUIRES NO EXTERNAL KEYBOARD
*GE FANUC AUTOMATION PLC OUTPUT MODULE (SERIES FIVE SHOWN)
MINI OIT
PARALLEL CABLE

Figure 1-5. Connecting the Mini OIT to a PLC through the Parallel Port

Feature Comparison with Other GE Fanuc OIT Models

The table below explains the differences in features between the full-sized monochrome OIT, the full-sized color OIT, and the Mini OIT.

Table 1-1. Feature Comparison Between OIT Models

Feature	Full Size Monochrome IC600KD530,533	Full Size Color IC600KD532,534	Mini OIT IC600KD515,516
OptiSCREEN Editing	Yes	Yes	Yes
Touch Screen CRT	No	No	Yes - IC600KD516 only
Keyboards Available (Sealed Membrane type)	34-pos. built in 65-position full ASCII	34-pos. built in 65-position full ASCII	65-position full ASCII
OptiBASIC Available	Yes - IC600KD533 only	Yes - IC600KD534 only	No
Ports	3 serial	3 serial	1 serial - 1 parallel
User Memory	IC600KD530- 60 Kbytes shipped 156 Kbytes total IC600KD533- 156 Kbytes shipped and total	IC600KD532- 60 Kbytes shipped 156 Kbytes total IC600KD534- 156 Kbytes shipped and total	IC600KD515, IC600KD516- 30 Kbytes shipped 62 Kbytes total
Memory Cartridge Option	Yes IC600KD533 only	Yes IC600KD534 only	No
Character Sets	95 ASCII, 161 Graphic, 80 Quad Size letters, numbers, symbols	95 ASCII, 161 Graphic, 80 Quad Size letters, numbers, symbols	95 ASCII, 33 Graphic from Supplemental Stand. char. set. Quad size letters, but no Alternate character set or Quad size process symbols
IBM Keyboard Connector Types	DIN for full-size IBM PCs. Modular for portable IBM PCs	DIN for full-size IBM PCs. Modular for portable IBM PCs	DIN type only for full size IBM PCs
Color CRT	No	Yes	No
Screen Size	12'' diag. 25 lines, 80 char. per line	12'' diag. 25 lines, 80 char. per line	5'' x 9'', 16 lines, 80 char. per line
Status Lines	1-4	1-4	None
Battery Backed Clock and Calendar	Yes	Yes	No
Bell Output	Yes	Yes	No
Reset Input	Yes	Yes	No

Keyboards Used With the Mini OIT

This section includes information on the keyboards available for use with the Mini OIT including the touch screen. Topics covered are:

- External Keyboards Used with the Mini OIT
- The Mini OIT Touch Screen

External Keyboards Used with the Mini OIT

The Mini OIT supports IBM PC-XT compatible keyboards for screen programming and for certain permanent applications. Also, a 65-key sealed keyboard is available for the Mini OIT. The sealed, flush-mounted keyboard has built-in tactile feedback and is designed for use in the most severe environments.

IBM PC-XT Compatible Keyboards

During screen programming, and for certain permanent applications, a full-travel Qwerty style keyboard may be desirable. A circular "DIN" style connector used with full size IBM PCs is provided on the rear panel of the Mini OIT.

Note

The IBM PC-AT type keyboard is not compatible with the Mini OIT.

An IBM PC-XT compatible keyboard may be connected and used simultaneously with any of the sealed keyboards.

The 65-Key Sealed Membrane Keyboard

The 65-key keyboard features a 5 x 13 block layout of large rectangular keys. The key legends are printed on strips of material that slide inside the keyboard matrix. This allows custom keyboard labeling at nominal cost, while maintaining a proven environmental seal. There are 3 standard keyboard layouts for this keyboard: Terminal, BASIC, and Qwerty. The key layouts for these keyboards are shown in the following figures.

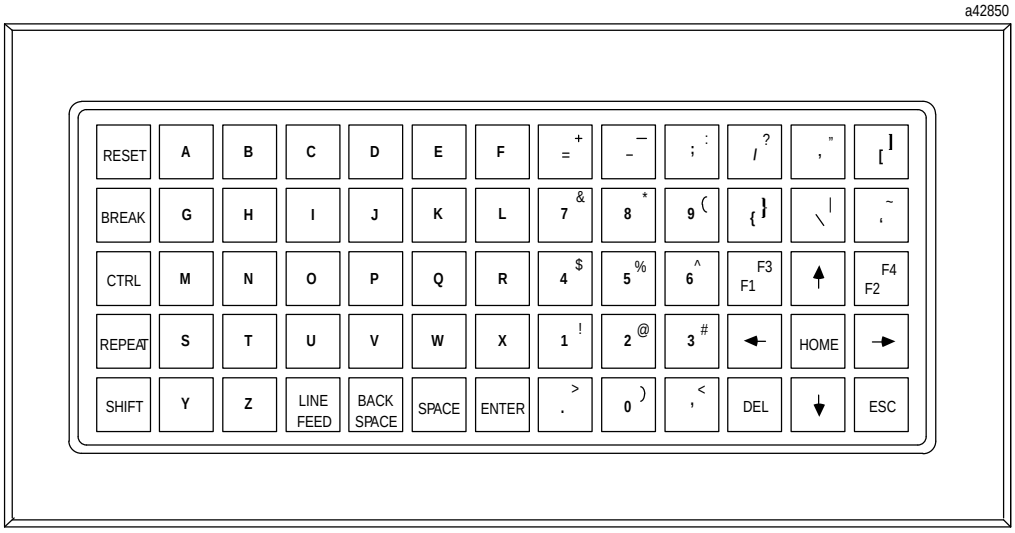


Figure 1-6. Keyboard Layout for the “Terminal” Version of the 65-Key Keyboard

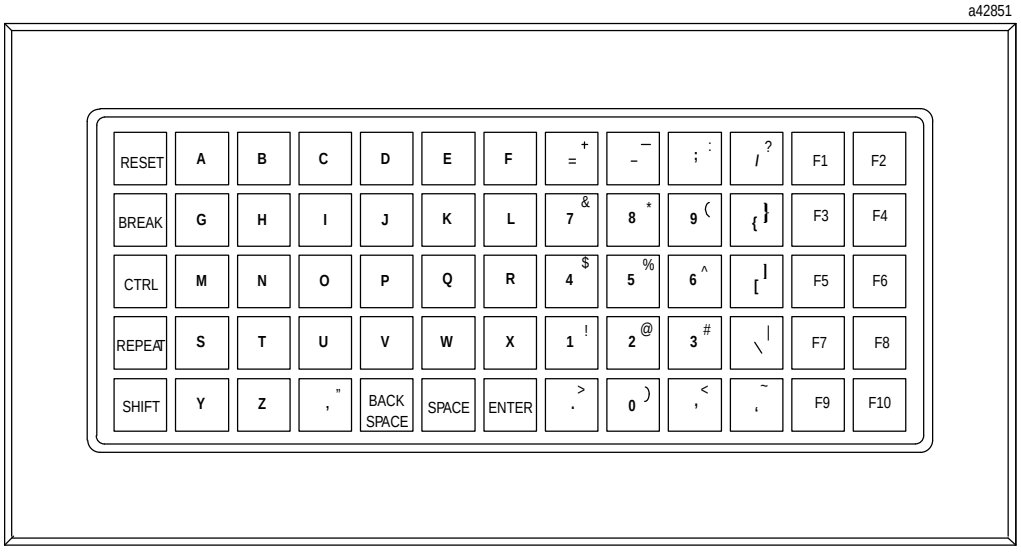


Figure 1-7. Keyboard Layout for the “BASIC” Version of the 65-Key Keyboard

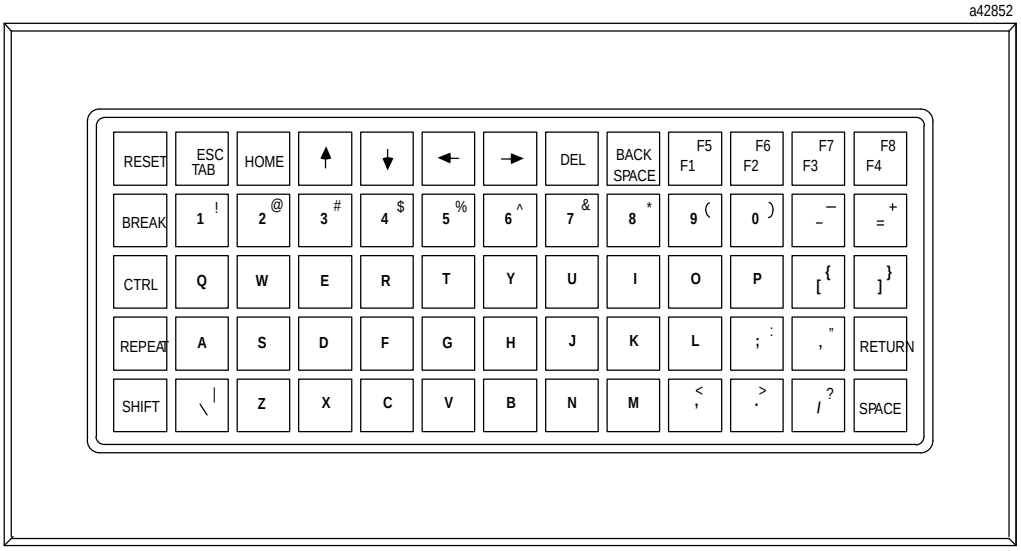


Figure 1-8. Keyboard Layout for the "Qwerty" Version of the 65-Key Keyboard

This keyboard consists of a series of membrane switches that are interpreted by the logic board of the Mini OIT. When different keyboard inserts are used with the keyboard, a different keyboard "Type" is selected from the Configuration screen. The Terminal layout is Type 1, the BASIC layout is Type 2, and the Qwerty layout is Type 4.

The Mini OIT Touch Screen

The CRT of the Mini OIT is segmented into 4 rows by 10 columns of key pads for a total of 40 keys. When the touch screen is used, Type 5 keyboard must be selected in the Configuration screen. The key value for each key can be programmed by the user. The touch screen keys are defined by using the OptiSCREEN Editor statement:

`MAKE TOUCH BOX Pn AT LOCATION Pn WITH VALUE Pn`

This command is used when designing a screen format. It allows you to draw a touch box at a specific location and of a particular size and type with a user defined value. See Appendix B for a complete list of values. When the touch box is pressed, the value is sent out the designated port or ports as it would when a key of any other keyboard was pressed.

Refer to Chapter 5 for details of programming the Touch Box command using the OptiSCREEN Editor.

Specifications of the Mini OIT

Listed below are the specifications for the Mini OIT, which include display, keyboard, physical and electrical, and miscellaneous data.

Display	
CRT - monochrome only:	5″ x 9″ high contrast amber.
CRT Window:	Gasketed .125″ smoked LEXAN (TM), UV hardcoated, scratch resistant and non-glare surface.
Display Format:	16 lines of 80 characters,
Display Size:	3.5″ high x 7.5″ wide.
Character Size:	0.2″ high x 0.1″ wide (approx.).
Character Set:	95 ASCII and 33 graphic from standard character set only, quad size letters, but no alternate character set or quad size process symbols.
Character Type:	5 x 7 dot matrix, except: 5 x 9 dot matrix for lower-case characters with descenders, 8 x 10 dot matrix for graphics.
Video Attributes:	Dim, normal, and highlight video for foreground and background, plus underline. Blink, and double wide on a character basis, double high and wide on a line basis.
Cursor:	Blinking or continuous, underline, block, or none.
Cursor Addressing:	Relative and direct.
Scroll:	Full or split screen.
Keyboard	
Sealed Keyboard	
Keyboard Tactile Feedback:	Built-in snap action.
Keyboard Surface:	Matte, UV hardcoated polycarbonate.
Keyboard Inserts:	One set preprinted standard legends.
Sealed Keyboard (65-key) (IC600KD511,optional)	65 keys in 5 x 13 rectangular matrix on .95″ centers, .6″ square viewable window area, fully sealed, with removable legend inserts (Basic, Terminal, Qwerty).
Full Travel Keyboard: (IC640PKB201,optional)	IBM PC-XT type compatible with DIN connector. (IBM PC-AT type keyboard is not compatible).
Physical and Electrical	0-50° Celsius.
Operating Temperature:	0-50° Celsius.
Operating Humidity:	5-95% RH, non-condensing.
Dimensions:	See outline drawings in Chapter 5
Cutout Size:	See outline drawings in Chapter 5
Front Panel Finish:	Black, textured polyurethane paint
Power Requirements:	Monochrome:105-135 / 210-270VAC, 45W. 50 / 60 Hz.
Miscellaneous	
Processor:	Z80
User Memory - OIT:	30 Kbytes battery-backed CMOS RAM expandable to 62 Kbytes RAM.
Interface:	Single non-isolated RS-232 / 422 serial port (DTE), and parallel TTL port. Parallel interface supports 8-bit input and output with strobe and busy control signals.
Data Rates:	50 to 38,400 baud standard.
Input Buffers:	256 characters per port.
Handshaking:	Serial port - (Bi-directional Control): Software via Control-S (X-ON) and Control-Q (X-OFF), or Hardware via RTS (pin 4) and CTS (pin 5); software selectable Parallel port - (Bi-direct. Control): Busy and Strobe signals supported. Directions are reversed (DCE).
Communications Mode:	No-Echo (full duplex) or Echo (half duplex), asynchronous. Point to point or multidrop operation.
Escape Sequences:	ANSI X3.64, VT100, or VT52 mode.
Parity:	Even, odd, space, mark, or none.
Word Size:	7 or 8 data bits plus parity bit.
Stop Bits:	Selectable, 1 or 2.
Editing / Erase Functions:	Through software, insert and delete character or line; erase line; erase from beginning of line; erase from end of line; erase from beginning of page; erase to end of page.

Chapter 2 Getting Started

This chapter explains how to start up the Mini OIT, perform basic keyboard operations, and do basic OptiSCREEN editing. To perform the steps in this chapter no external device need be connected except a keyboard.

Topics covered in this chapter are:

- Installing the Battery
- Attaching the Keyboard
- Powering Up the Mini OIT
- Modes of Operation: On Line, Local, Edit
- Using the Configuration Menu
- Using the OptiSCREEN Editor

When you receive your Mini Operator Interface Terminal (Mini OIT) package, you should receive the Mini OIT and a user's manual.

Keep the OIT shipping box and packing materials so that you can safely and efficiently ship the Mini OIT if you need to.

You must supply several items not provided with the Mini OIT:

- A medium-sized, flat-headed screwdriver and a Phillips screwdriver. You will use the screwdrivers for several jobs as you start to use your Mini OIT.
- An IBM PC-compatible keyboard or IBM PC-XT-compatible keyboard. The Mini OIT does not support the IBM PC-AT-compatible keyboard.
- An AC power cord.

Installing the AC Power

1. Locate the AC power terminal strip on the back of your Mini OIT and remove the yellow terminal block shield.
2. Using a screwdriver, attach the three wires from an AC power cord to the terminals:

Terminal	Wire
L1	Hot
L2	Neutral
L3	Ground

3. Replace the yellow terminal block shield.

Installing the Battery

1. Locate the small rectangular battery cover plate on the back of the Mini OIT. Remove the two Phillips screws from the plate, and separate the plate from the Mini OIT. Notice how two clips hold the battery on the back of the plate.
2. Locate two sets of battery connections on the logic board just inside the Mini OIT chassis. Plug the mating connector from the battery cable onto one of the connections on the logic board. Make sure that the notched side of the mating connector faces away from you as you plug it in.
3. Put the cover plate back on the Mini OIT and replace the two screws.

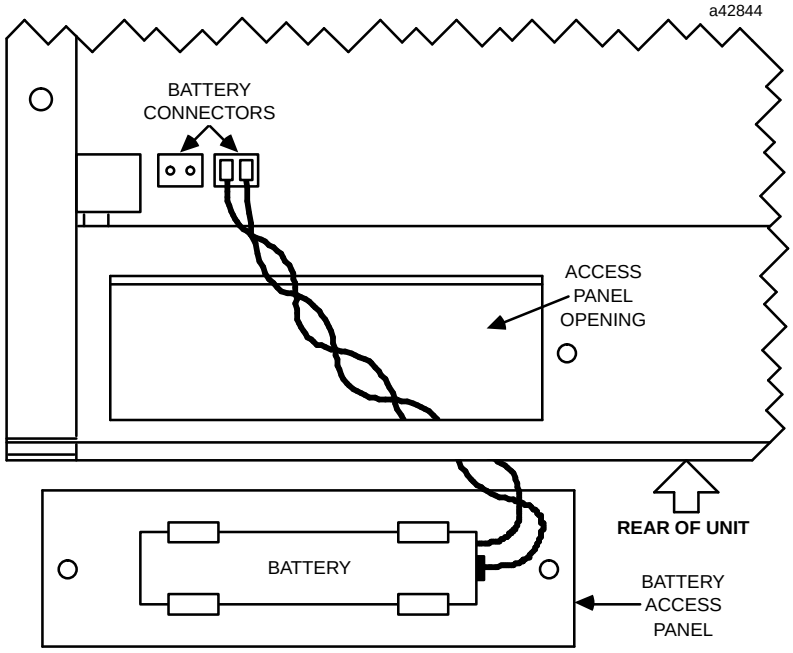


Figure 2-1. Installing the Battery

Attaching the Keyboard

The OIT requires the use of an IBM PC-compatible or XT-compatible keyboard; the OIT does not support the IBM AT-compatible keyboard although many AT keyboards can be used as an XT keyboard by setting a switch on the keyboard.

For proper operation, the power to the Mini OIT must be turned off before plugging the keyboard into the Mini OIT or unplugging the keyboard.

Make sure that the Mini OIT is turned off, and plug the keyboard into the Mini OIT.

Powering-Up the Mini OIT

Plug in the Mini OIT and turn on the AC power switch on the back of the unit.

Caution

The OIT is designed to operate at 120 Volts AC, 60 Hz. Applying 220 Volts AC damages this unit and voids the user warranty.

Make sure that the voltage corresponds to the voltage requirement indicated on the identification label located on the rear panel of the unit.

When you turn the unit on, allow the Mini OIT a few seconds to warm up. During this time the terminal will perform self-diagnostics which test the following:

- Proper battery voltage
- Proper operation of all system memory
- Proper functioning of peripheral circuits

If all tests pass, the message, "SELF TEST OK", will be displayed momentarily before the Mini OIT continues the power up sequence. This message may not be visible if the Mini OIT has been powered off for some time and the CRT is not warmed up. If any test fails, a message indicating the type of failure will be displayed.

Note

If the power-up diagnostics pass and if the terminal configuration previously saved was for Local mode or Edit mode operation, the terminal will automatically enter the Configuration screen. If a power-up test fails, follow the instructions below to get to the Configuration screen, or to the On-Line mode if it was previously selected and saved.

Battery Voltage Test

If during the battery voltage test the voltage falls below a certain level, the message, "BATTERY PROBLEMS", appears. When this first occurs, a limited amount of battery life may remain. The message, "BATTERY PROBLEMS", will also be displayed if the battery connectors for user memory are improperly installed.

If the message, "BATTERY PROBLEMS", appears, first check to see if the Memory Power Supply jumper is correctly positioned for the type of memory installed. If a CMOS RAM memory chip has been installed in socket U25, the jumper should be in position W18-W19. (See Figure 3-20 for location.) If the jumper location is correct, the battery needs to be replaced. Do not remove the old battery assembly until the new assembly has been connected.

Note

If the battery is not connected, the terminal will still pass the battery test. The configuration screen will always be displayed with default values selected when the battery is not connected.

Memory Test

In addition to checking the battery voltage, the power-up diagnostics routine performs a checksum on user file memory. A checksum is a mathematical calculation that is performed to see whether memory has been corrupted. This checksum is compared with the last checksum stored previously. If the checksum is incorrect, the message, "USER MEMORY HAS A CHECKSUM ERROR", appears, followed by the instructions shown below:

```
Press 1 to initialize memory and erase screen files.
Press 2 to initialize checksum only.
Press any other key to continue.
```

Pressing 1 will cause user memory to be initialized and the new checksum stored. Pressing 2 will store the new checksum only. This allows you to retain the contents of memory. It may be corrupted, however, so you must verify the screens you stored in memory before the checksum error occurred. Pressing any other key causes the message to be ignored.

The following conditions will cause the message, "CHECKSUM ERROR", to be displayed:

- Initial power-up after batteryinstallation / replacement.
- Initial power-up after additional user memory has been installed.
- The terminal is turned off or is reset while a file storage operation is taking place.
- Battery back-up jumper(s) for the user memory are not properly installed.
- Hardware failure.

Modes of Operation

There are three modes of operation in which the Mini OIT can power up.

On-Line mode: Normal operating mode after installation and program development are complete.

Edit mode: Mode for accessing the OptiSCREEN editor to create screens using English language statements.

Local mode: Mode for creating screens using escape sequences or for testing operation of escape sequences.

The power-up mode is selected in the Configuration menu. If the Edit mode or Local mode has been selected, the Configuration menu will appear after power up and will be displayed for about 30 seconds before the selected mode is entered. If you change an option on the Configuration menu or simply move the cursor, the screen will remain displayed about 4 minutes before entering the selected mode. Any subsequent operation on the Configuration menu will reset the timer.

If the On-line mode was previously selected, the Mini OIT will enter the On-line mode directly after power up, and the Configuration menu will not appear.

If the Mini OIT is already powered up and the selected mode of operation has been entered (On-line, Edit, Local) you can access the Configuration menu by pressing the Control key and the number 1 [Ctrl]-1 on the keyboard simultaneously.

Using the Configuration Menu

Note

The Configuration menu can be accessed by pressing [Ctrl]-1.

A sample Mini OIT Configuration menu with a representative configuration is displayed below. At the left side of the screen is a list of the various modes and functions that may be selected. These correspond to the status messages shown on the same row at the right side of the screen. The box at the bottom of the menu describes the operations which can be performed while in the Configuration mode, and the keys that may be used to perform them.

```
      Ge Fanuc Operator Interface Terminal          Rel 2.5-32    060ct93
_____________________________________________________________________________
OPERATION                                  LOCAL      ANSI  NO ECHO  SEND ANY CASE
END LINE/COLOR                             NO WRAP  NO AUTO LF
CURSOR/SCREEN                              BLINKING BLOCK       CRT SAVER OFF
KEY CODES                                  THREE
SERIAL PORT                                9600   EVEN  7 BIT 1 STOP HARD  PT TO PT
PARALLEL PORT MODE                         PARALLEL IS AUXILIARY, SERIAL IS PRIMARY
CONFIGURATION                              SAVE
TESTS                                      DIAGNOSTIC
MEMORY                                     SAVE    SCREENS  00  TO  SCREENS  00
_____________________________________________________________________________

  -UP-      -DOWN-      -LEFT-      -RIGHT-     -SELECT-    -PERFORM-    -EXIT-
   F1         F2          F3          F4          F5          F6          F7
```

Figure 2-2. The Configuration Menu

Modifying the Configuration Menu

This is done as follows:

1. Move the cursor to the status message which is to be changed by using appropriate function keys [F1]-[F4].
2. When the cursor is at the desired status message for a particular feature or function, press the Select key [F5] to scroll through the options available.
3. When the desired option is displayed, set the terminal to the new status by simply moving the cursor to another status message.
4. After you have selected the desired option for all the features and functions, you can temporarily save the configuration by pressing the Exit key [F7] to take the terminal out of Configuration mode. In this case the configuration will be maintained only as long as the Mini OIT is powered up.

Saving and Recalling the Configuration

The configuration can be saved for future power-off / power-on cycles. When this is done, the saved configuration will be entered automatically by the terminal on power-up, regardless of the configuration it had when power was shut down.

To **save** a configuration set-up, follow this procedure:

1. Move the cursor to the configuration SAVE / RECALL status message.

2. Press the Select key [F5] to display the SAVE message.

3. Press the Perform key [F6] to save the displayed configuration.

Note

Any previously saved configuration will be lost when the Save command is executed.

If you have made changes to the configuration, but you want to **recall** the last configuration that was saved, follow this procedure:

1. Move the cursor to the configuration SAVE/RECALL status message.

2. Press the Select key [F5] to display the RECALL message.

3. When the RECALL message is displayed, press the Perform key [F6] to reset the terminal to the last configuration that was saved.

Exiting the Configuration Menu

This is done by pressing the Exit key [F7]. The terminal will automatically exit the Configuration menu if the terminal is allowed to remain idle for a period of about 4 minutes. In either case, the terminal will automatically go into the operating mode displayed on the screen.

When the terminal exits the Configuration menu, the screen will be cleared and the cursor (if selected) will be in the upper left corner of the screen (HOME). Any data on the screen prior to entering the Configuration menu will NOT be restored.

Using the OptiSCREEN Editor

In this section of the "Getting Started" chapter, you create and display five simple screen files: a text screen file, a graphics screen file, a relative graphics screen file, a screen file that calls the relative graphics screen file, and a file with touch boxes. Also included is a more complete sample screen file.

First select the Edit Function from the Configuration menu and press the Perform key [F7]. The OptiSCREEN Editor Menu will be displayed as shown below.

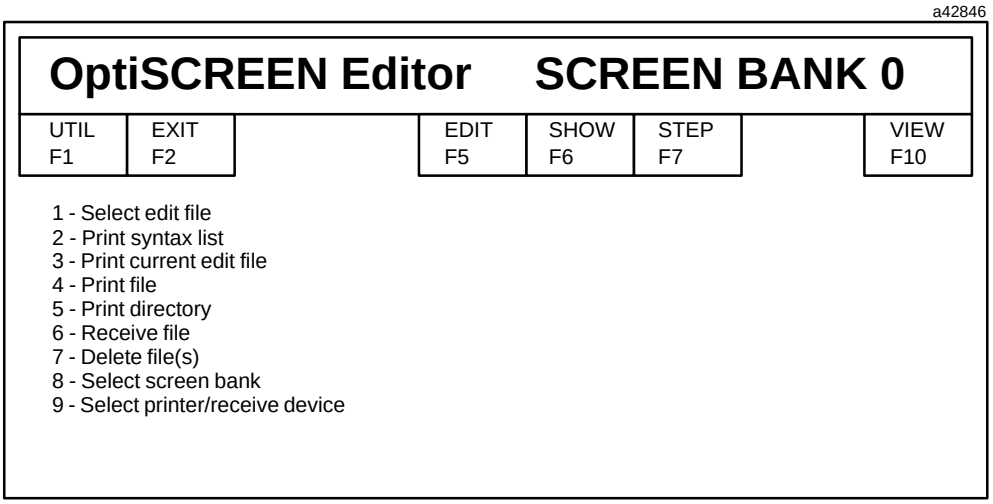


Figure 2-3. The OptiSCREEN Editor Screen

From the OptiSCREEN Editor menu you can access a variety of functions including the editor and directory. You can also view the currently selected screen file by pressing the [F6] SHOW key.

Note

When you enter an editor function, the function keys are no longer displayed. You can always return to the the OptiSCREEN Editor menu by pressing the [F1] UTIL key.

Creating a Text Screen File

1. First press the number 5, Print Directory, to see if a file number ”100” exists. The Text Screen File you will be creating will be numbered ”100”.
2. If it does exist, delete it by doing the following.
   A. Exit the file directory by pressing [F1] UTIL.
   B. Press the number 7, Delete Files, to enter the Delete File(s) function.
   C. Answer N to the prompt ”All Files”.
   D. Enter the number 100 for the file to be deleted, and press Return. After deleting the file, the system returns you to the OptiSCREEN Editor menu so that you can continue working.
3. If file number 100 does not exist, press the number 1, Select Edit File, from the OptiSCREEN Editor menu.
4. Enter the number 100 at the prompt ”Type file number:” The OptiSCREEN editor places you in an empty screen.

   Enter the following commands to generate the screen file. Feel free to enter the name of your company between quotes where *YOUR COMPANY* appears below:

```
'100 - Text file
CLEAR SCREEN
MOVE TO 5, 10
QUAD SIZE
DISPLAY "100"
BRIGHT
/DIM
MOVE TO 10, 10
DISPLAY "YOUR COMPANY"
EXIT QUAD
_
END
```

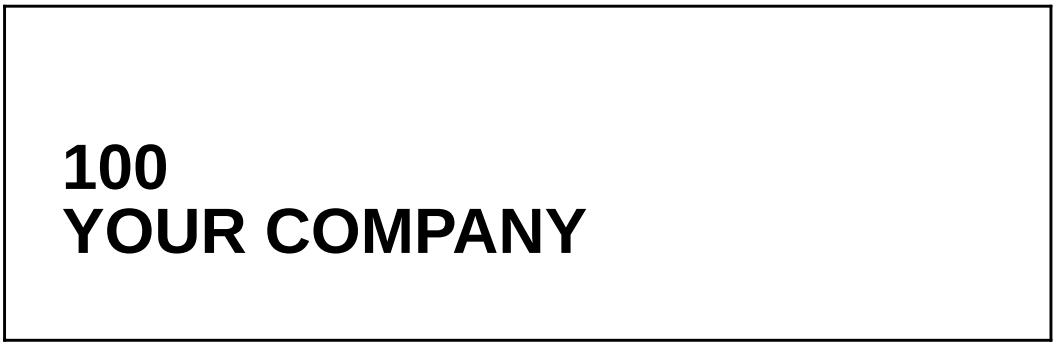
Information about the individual commands helps you understand the purpose of this file:

- The first line, *'100 - Text file,* demonstrates a comment line. Starting a line with an apostrophe (the character two keys to the right of the L key) makes any line a comment, or a remark, for the OptiSCREEN file. Comments help document the purpose of commands and statements in individual files. Also, when you make the first statement of a screen file a comment, the comment identifies the file when you generate a file directory.
- The *CLEAR SCREEN* command clears the entire Mini OIT screen and resets all attributes. You see this command at the beginning of files and whenever you want to "start fresh" in a system.
- The *MOVE TO 5, 10* and the *MOVE TO 10, 10* commands cause the text or graphics that follow to appear in a specified location. The first MOVE command starts the display of text at row 5 and column 10 on the screen. The second command starts the display of text at row 10 and column 10. A Mini OIT includes 16 rows, numbered from the top of the screen to the bottom. It includes 80 columns, numbered from the left side of the screen to the right.
- The *QUAD SIZE* and *EXIT QUAD* command pair are "character attribute commands." They affect the appearance of all text that falls between the two commands. In general, a character fills a single cell so that it appears one row tall and one column wide. A quad size character appears four rows tall and four columns wide. Quad size characters appear in an uppercase (capitalized) form only.
- The *DISPLAY* command specifies the text that appears on the screen. The first DISPLAY command specifies the number and name of the file, "100," and the second specifies the name of "YOUR COMPANY." As noted above, quad size characters appear in uppercase only, so you must enter capitalized text.
- Like QUAD SIZE, the *BRIGHT* and */DIM* commands are character attribute commands; they affect the appearance of all text and graphics that fall after the commands. In this case, *BRIGHT* specifies that the text and graphics appear in bright mode on the screen; */DIM* specifies that the text and graphics appear on a dim background.
- The system automatically places the required *END* command on the screen. When you display the screen file again, the system deletes the blank line before the *END* command.

As you entered these commands, you may have noticed some interesting things:

- The system automatically capitalizes the commands for you when you press the [Enter] key to move to a new line. It does not, however, capitalize text that appears within quotes.
- When you press the [Enter] key, the system also correctly spells out commands that you abbreviated or misspelled as you entered them.
- You can use the cursor control keys to move through the screen file and make corrections to the text.
- You can press the [Ctrl]-Ins key combination to insert a new, blank line into the middle of the file.
- You can press the [Ctrl]-Del function key to delete the line that the cursor currently covers in the file.
- You can press the [Ins] key to change from replacement, or overwrite, mode to insertion mode and add new text to the file. In insertion mode, existing text shifts to the right to make room for the new text.
- You can press the [Del] key to delete the character that the cursor currently covers.
- If you enter the first character or characters of a screen command and then pause before completing the command, the system displays a help screen that outlines the syntax for the commands that begin with the letter or letters you've entered.

5. To display the screen file on the Mini OIT, press the [F6] SHOW function key:



This shows how the screen appears when you call it from an external device or call it from another program.

6. Press the [F5] EDIT function key to return to the screen file for further editing:

```
'Test1 - Text file
CLEAR SCREEN
MOVE TO 5, 10
QUAD SIZE
DISPLAY "100"
BRIGHT
/DIM
MOVE TO 10, 10
DISPLAY "YOUR COMPANY"
EXIT QUAD

END
```

At this point, you can add commands to the screen file or you can make changes to the existing commands in the screen file. Press the [F6] SHOW function key to display the screen again, and press the [F5] EDIT key to return to the screen file for further editing.

7. To save the screen file, first return to the OptiSCREEN Editor menu. If you are displaying a screen file or editing the screen program this is done by pressing the [F1] UTIL key.

   There are a number keys you can press to initiate the "Save" operation. If you wish to exit the OptiSCREEN Editor after saving, press the [F2] EXIT key. If you wish to edit a different screen file after saving, press the number 1.

   After the "Save" operation is initiated, prompts as shown below will appear. SAVE EDITED CHANGES? (Y or N). Press Y to save or N if you do not want to save the file.

   After edits to a screen file have been saved, the following message appears, CHANGE FILE NUMBER? (Y or N). If Y is pressed, the message, TYPE NEW FILE NUMBER, appears. When the new file number has been entered, it flashes COMPLETED and returns to the Configuration menu. The old file remains in the directory in the same form it had before being edited.

   The file name is an optional part of the screen file. To **name** a file, enter the file name as a comment on the first line of the screen file. To rename the file, simply change the name in the first line.

8. Press the [F1] UTIL function key to return to the OptiSCREEN Editor menu. Then press the number 5, Print Directory, to see that the screen file 100 is in the directory.

You are now ready to create another screen file or perform another function.

Creating a Graphic Screen

The first screen file that you created showed two lines of text. In this example you create a simple graphic display.

1. Look in the directory for a file named *110*. Do this in the same manner as before in the section, Creating a Text Screen File. If the file does not exist, move to step 2. If the file exists, delete it.

2. If the file number 110 does not exist, press 1, Select edit file from the OptiSCREEN editor menu.

3. Enter 110 at the prompt "Type file number:" The screen file editor places you in an empty screen. Enter the following commands to generate the screen file:

```
'110 - Graphic file
MOVE TO 10, 10
BOX 8 x 8
UP 5
RIGHT 1
SUPPLEMENTAL
DISPLAY "bpoopc"
LEFT 6
DOWN 1
DISPLAY "|"
DOWN 1
LEFT 1
DISPLAY "erssrd"
LEFT 1
UP 1
DISPLAY "}"
EXIT SUPPLEMENTAL


END
```

Several new commands and different uses of old commands appear in this example:

- The *BOX* command draws a box on the screen. In this case, the box is 8 rows tall and 8 columns wide. The system draws boxes from the lower left-hand corner of the box. That is, you use the MOVE TO command to move to a specific location on the screen, and the BOX command draws up a specified number of rows and to the right a specified number of columns.
- The *UP* command moves the cursor up a specified number of columns. In this case, the cursor moves up 5 rows. OptiSCREEN also offers a RIGHT command, an UP command, and a DOWN command.
- The lowercase letters in the DISPLAY commands appears as supplemental graphic characters rather than a text character. In this example these characters form a circle with the box.

4. To display the screen file on the Mini OIT, press the [F6] SHOW function key.
5. Press the [F5] EDIT key to return to the screen file for further editing. At this point, you can make changes to the existing commands in the screen file.
6. Save the screen file in the same manner as described before in the section, Creating a Text Screen File.

Changing a Screen File from Absolute to Relative

In this part of "Getting Started," you change screen file *110* to make it a relative screen file. (Descriptions of "absolute" and "relative" files appear below.) In the next part of this chapter, you use the changed relative screen file.

1. Call up the file 110 you created in the previous section by entering the Select Edit File function from the OptiSCREEN Editor menu.
2. Delete the second line in the file *(MOVE TO 10, 10)*. To do this, move the cursor to the second line and press the [Ctrl]-Del key combination. After the deletion, the file looks like this:

```
'110 - Graphic file
BOX 8 x 8
UP 5
RIGHT 1
SUPPLEMENTAL
DISPLAY "bpoopc"
LEFT 6
DOWN 1
DISPLAY "|"
DOWN 1
LEFT 1
DISPLAY "erssrd"
LEFT 1
UP 1
DISPLAY "}"
EXIT SUPPLEMENTAL

END
```

This is now a relative graphic screen file. The commands in the file do not display the output from the file in an absolute position; the commands display the output in any location that you specify. Notice that the file does not contain the CLEAR SCREEN command but contains both the SUPPLEMENTAL and EXIT SUPPLEMENTAL commands.

An example of how to display this relative file appears in the next section of this chapter.

3. Save the file as described before in the section, Creating a Text Screen File.

You can now generate the screen file that calls the relative screen file.

Calling a Screen File from Another Screen File

In this section of the chapter, you call the relative screen file that you just created from another screen file.

1. Look in the directory for file number 120. If the file does not exist, move to step 2. If the file exists, delete it as described before.
2. Enter the Select Edit File function from the OptiSCREEN Editor and type in the file number, 120, at the prompt.
3. The screen file editor places you in an empty screen. Enter the following commands to generate the screen file:

```
'120 - Calling another screen file
CLEAR SCREEN
BRIGHT
MOVE TO 10, 10
DISPLAY FILE 110
NORMAL
MOVE TO 10, 20
DISPLAY FILE 110
DIM
MOVE TO 10, 30
DISPLAY FILE 110

END
```

The *DISPLAY FILE* command in this screen file causes the system to display the contents of screen file *110* in the locations, and in the modes, that you specify.

4. To display the screen file at your Mini OIT, press the [F6] SHOW function key. Note the location and brightness of the graphics as they appear on the screen.
5. Press the [F5] EDIT function key to return to the screen file for further editing. At this point, you can make changes to the commands in the screen file.
6. Save the File as described before.

Programming the Touch Screen

This section of the "Getting Started" chapter is designed for users with a touch screen on their Mini OIT. In this section, you create a screen file which includes OptiTOUCH commands. Skip this section of the chapter if your Mini OIT does not offer a touch screen.

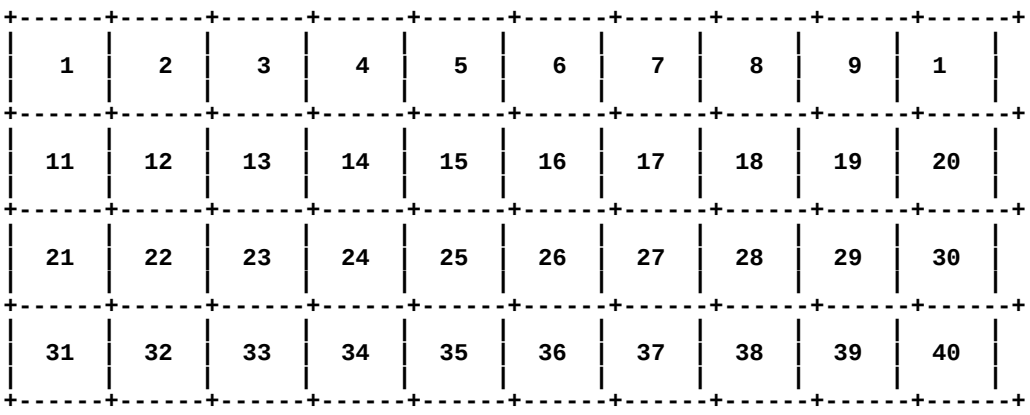
Configuring the Mini OIT

To make the touch screen functional, you must use the Configuration Menu to specify that you want to use KEY CODES 5 for programming the touch screen.

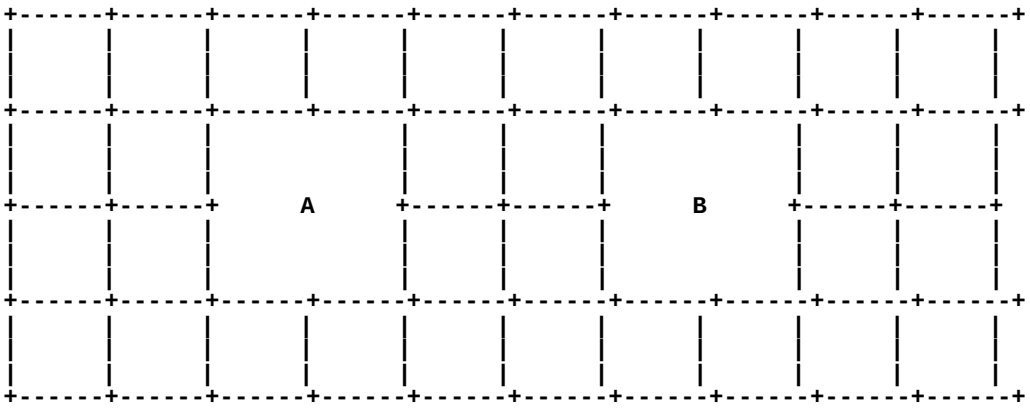
To do this return to the section, "Using the Configuration Menu," in this section.

Determining the Touch Screen Layout

In this example, you create two large interactive boxes on the touch screen. The programmable touch screen offers boxes in the following positions:



This is the touch screen keyboard layout that you use in this example:



Creating the OptiSCREEN File

1. Look in the directory for file number 130. If the file does not exist, move to step 2. If the file exists, delete it as described before.
2. Enter the Select Edit File function from the OptiSCREEN Editor and type in the file number, 130, at the prompt.
3. The screen file editor places you in an empty screen. Enter the following commands to generate the screen file:

```
'Mytouch - File for two-box touch screen demo
CLEAR SCREEN
CLEAR KEY TABLE
MAKE TOUCH BOX 4 AT LOCATION 23 WITH VALUE 65
MAKE TOUCH BOX 4 AT LOCATION 27 WITH VALUE 66
END
```

   The *CLEAR KEY TABLE* command in this screen file eliminates previous specifications. The *MAKE TOUCH BOX* commands in this screen file define the size of the touch boxes (*BOX* style number *4* out of eight different box formats), the "beginning location" of the touch box (*LOCATION 33* and *LOCATION 37*, as shown above) and the ASCII value for the output (ASCII code *65* for the letter "A" and *66* for the letter "B"). For more information see the MAKE TOUCH BOX command in Chapter 5.

4. Display the screen with the [F4] SHOW function key. Although nothing happens, you can press one of the on-screen keys you just defined.

Creating a Sample Screen Format

A sample screen format is shown in the figure below. The sample format can be created by typing in the program which is listed after the figure. The format includes a variety of OptiSCREEN statements to help you become familiar with the overall characteristics of screen programming.

To execute the sample screen that follows, select keyboard type 5 from the Configuration menu if you have the touch screen model. If you do not have the touch screen (Mini OIT-Touch), select the type you would be using for normal operations.

Note

A screen may not be displayed correctly if the configuration settings when it was created are different from when it is recalled: for example, if type 5 keyboard is selected at the time of creation and type 1 is selected when recalled. If the configuration needs to be changed while on-line, be sure to reset it to the proper state before displaying a new screen.

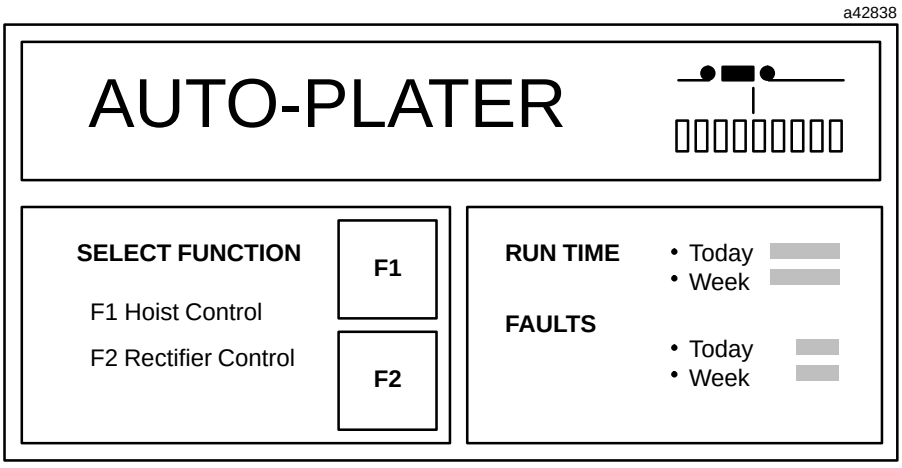


Figure 2-4. Sample Screen Format

The Sample Program

Comments explaining how the sample program works are included in the listing. The recommended method for entering the program is as follows.

1. Enter a single block of program lines at a time; the blocks are separated in the listing by a blank comment line.
2. After entering a block of lines, press the [F6] VIEW Function key to display the part of the program entered. To study how the program is working, switch back and forth between the display of the screen and its program by alternately pressing [F6] VIEW and [F5] EDIT.
3. Re-enter Edit, type in the next block of lines, and repeat the procedure above.

```
'Sample Screen File                    This is the Screen Title.
' CLEAR KEY TABLE                     Use clear key table only if
RESET LINE ATTRIBUTES                  using touch screen.
CLEAR SCREEN
'
MOVE TO 7, 1                           These statements draw the box
BOX 7 X 80                             for the screen heading and
MOVE TO 5, 5                           display the words AUTO-PLATER
QUAD SIZE                              in Quad size letters.
DISPLAY "AUTO-PLATER"
EXIT QUAD
'
MOVE TO 2, 59                          These statements draw the
DISPLAY "_____________"                symbol for the Auto-Plater
MOVE TO 3, 64                          using normal ASCII characters
DISPLAY "|"                            and characters in the Supple-
SUPPLEMENTAL                           mental character set.  Be sure
MOVE TO 2, 61                          to note that the Supplemental
DISPLAY "~pp~"                         character set letters are lower
MOVE TO 4, 59                           case.
DISPLAY "lklklklklklklk"
MOVE TO 5, 59
DISPLAY "mjmjmjmjmjmjmj"
EXIT SUPPLEMENTAL
'
MOVE TO 16, 1                              These statements make up the
BOX 8 X 40                                 Select Function area.  The
MOVE TO 10, 2                              DOUBLE WIDE, BRIGHT, AND BLINK
DOUBLE WIDE                                Commands are used to emphasize
```

```
BRIGHT                                                  the action to be taken.
BLINK
DISPLAY ”SELECT FUNCTION”
EXIT DOUBLE WIDE AND BLINK
RESET ATTRIBUTES
MOVE TO 12, 5
DISPLAY ”F1 Hoist Control”
MOVE TO 14, 5
DISPLAY ”F2 Rectifier Control”
’
REVERSED                                               These statements construct the
MAKE TOUCH BOX 1 AT LOCATION 25 WITH VALUE 66          touch boxes for sending the
MAKE TOUCH BOX 1 AT LOCATION 35 WITH VALUE 67          selection back to the host.  If
DOUBLE WIDE                                            you do not have the touch screen
MOVE TO 10, 35                                         you will not include the touch
DISPLAY ”F1”                                           box commands, but will use keys
MOVE TO 14, 35                                         on an attached keyboard to
DISPLAY ”F2”                                           select a function.
RESET ATTRIBUTES
’
MOVE TO 16, 43                                         These statements form the
BOX 8 X 38                                             Display RUN TIME and FAULTS area
MOVE TO 10, 45                                         of the screen.
DOUBLE WIDE
BRIGHT
DISPLAY ”RUN TIME”
MOVE TO 14, 45
DISPLAY ”FAULTS”
RESET ATTRIBUTES
SUPPLEMENTAL
MOVE TO 10, 63
DISPLAY ”~”
MOVE TO 11, 63
DISPLAY ”~”
MOVE TO 14, 63
DISPLAY ”~”
MOVE TO 15, 63
DISPLAY ”~”
EXIT SUPPLEMENTAL
MOVE TO 10, 65
DISPLAY ”Today”
MOVE TO 11, 65
DISPLAY ”Week”
MOVE TO 14, 65
DISPLAY ”Today”
MOVE TO 15, 65
DISPLAY ”Week”
’
/DIM                                                   These statements are part of the
MOVE TO 10, 72                                         Data Fill operations explained
DISPLAY ”{ENQ}{ENQ}{ENQ}{ENQ}{ENQ}”                    in Section 2 of this chapter.
MOVE TO 11, 72                                         The Data Fill operations are
DISPLAY ”{ENQ}{ENQ}{ENQ}{ENQ}{ENQ}”                    used to make it easier for the
MOVE TO 14, 74                                         host to place dynamic data in
DISPLAY ”{ENQ}{ENQ}{ENQ}”                              different locations on the
MOVE TO 15, 74                                         screen.  The /DIM command is
DISPLAY ”{ENQ}{ENQ}{ENQ}”                              only included here to show where
’                                                      data from the host will be
END                                                    displayed.  Normally, the Data
                                                       Fill statements would be a
                                                       separate file from the rest of
                                                       the screen.  See Data Fill
                                                       operations in Section 2.
```

Now That You’ve Started

This chapter outlined a number of the basic capabilities of the Mini OIT. The rest of this manual expands on the information presented here:

- Chapter 3 of this manual, ”Installation,” describes the physical and electrical requirements of the Mini OIT.
- Chapter 4, ”Operation,” describes menus and screens that the system provides, and outlines the steps you take to use the system.
- Chapter 5, ”OptiSCREEN Command Reference,” completely describes the OptiSCREEN commands.
- The appendixes found at the end of this guide contain information about the physical measurements of the Mini OIT and symbols available in the system.

Chapter 3 Installation

This chapter describes in detail all hardware-related topics for the Mini OIT. Topics covered in this chapter are:

- Mounting the Mini OIT
- Rear Panel Connections
- AC Power
- Battery Replacement
- Serial and Parallel Ports
- Installing Memory
- CRT Adjustment

Mounting the Mini OIT

Install your Mini OIT in an industrial rack or in a special panel cutout for the unit. When properly mounted, the Mini OIT maintains its NEMA 4 and NEMA 12 ratings.

Refer to Appendix A for the required panel cutout and mounting holes for installing the Mini OIT. The Mini OIT uses 10-32 mounting studs.

Caution

To avoid damaging the studs and the front panel, do not over-tighten the nuts on the mounting studs. This damage is not covered by the warranty.

You should keep the Mini OIT box and packing materials so that you can use them if the unit ever needs to be shipped again.

Rear Panel Connections

The lower rear of the OIT chassis contains all the connections you need during installation.

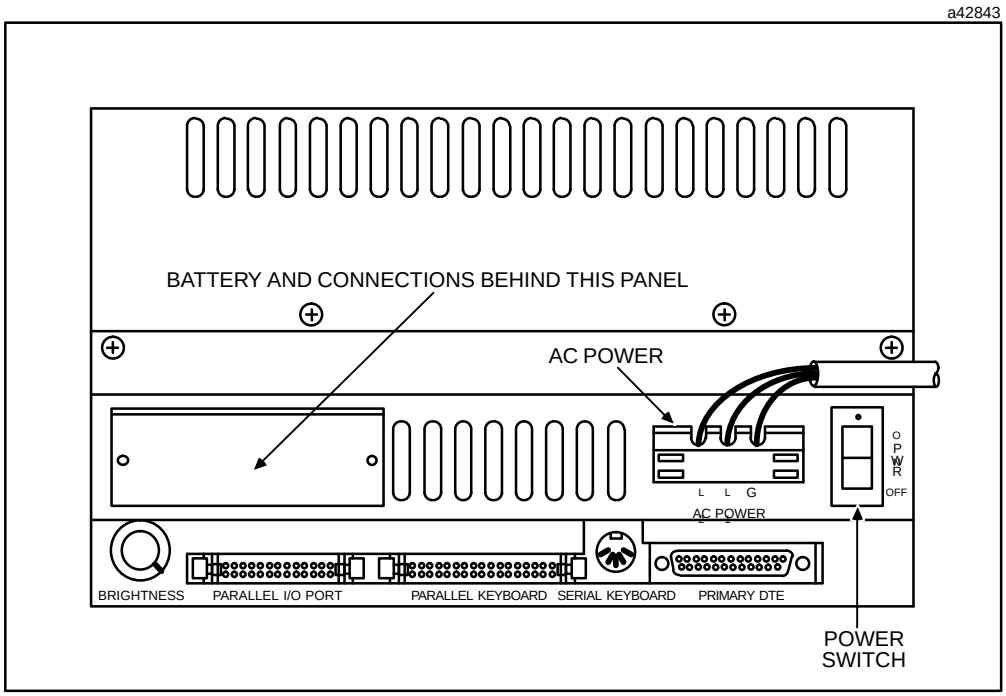


Figure 3-1. Rear View of the Mini OIT

Note

Located on the bottom of the Mini OIT is an 8-position DIP switch. At this time no user options are associated with this switch, and all positions should be left in the ON position.

A description of each of the items shown here appears in this chapter.

AC Power

You must supply your own AC power cord to attach power to the Mini OIT. The Mini OIT is designed to operate at 120 Volts AC, 60 Hz. The three terminals use the following designations.

Terminal	Wire
L1	Hot
L2	Neutral
L3	Ground

Caution

Applying 220 Volts AC damages this unit and voids the user warranty. Make sure that the voltage corresponds to the voltage requirement indicated on the identification label located on the rear panel of the unit. Consult the factory if you require a different voltage.

Battery Replacement

The Mini OIT uses a lithium battery to maintain the user memory for screens and data files. The battery has a nominal shelf life of five years and maintains the user memory for up to a year depending upon the amount of memory installed.

Warning

Lithium batteries cannot be recharged. Do not discard the lithium battery in fire. Do not short the battery. The battery may burn or release hazardous materials if damaged. Replace the battery with an identical lithium battery.

The battery assembly consists of a battery with a short cable and a mating connector.

Figure 3-2. Battery Assembly

To replace a battery in the Mini OIT, perform the following steps. Unlike the battery installation procedure you do have to remove the bottom panel of the chassis to replace the battery.

1. Unplug the Mini OIT from the main power source.

Warning

High voltages are present in the terminal while power is connected, even if the unit is turned off.

2. Place the Mini OIT face down on a non-abrasive surface. Position the unit so the bottom is facing you.
3. Locate and remove the 10 screws holding the bottom panel of the chassis.
4. There are two ribbon cables that connect the bottom chassis to the top chassis. Unplug the ribbon cables, noting their proper location and orientation for later reinstallation.
5. Lower the bottom chassis.
6. Two clips hold the old battery to the back of the battery coverplate. Disconnect the old battery from the clips on the battery coverplate.
7. A pair of two-position connections exist inside the battery coverplate opening on the main logic board. The old battery is attached to one of the two-position connections.

   While the old battery remains attached, connect the new battery to the two unused battery connectors on the logic board. Be sure to use the notches on the battery

connector to install the battery with the correct polarity. Assuming that the old battery retains some power, this "double battery" allows you to save any data in user memory.

8. Remove the old battery from the battery connector on the logic board.
9. Install the new battery in the clips on the battery coverplate.
10. Reconnect the ribbon cables and reinstall the bottom panel of the chassis.

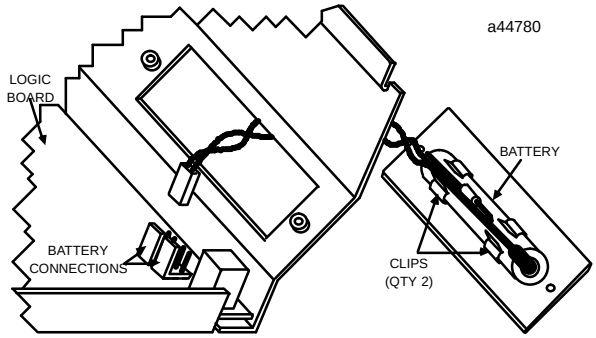


Figure 3-3. Replacing the Battery

DIP SWITCHES

The bank of dip switches located on the underside of the Mini OIT terminal has the following meanings. Note that definitions for switches 2 and 3 are new as of the new firmware release 2.5-31; the definitions for switches 1 and 8 remain as previously defined.

SW#	ON	OFF	Default
1	No test	Automatic manufacturing test	ON
2	IC600KD515A IC600KD516A	IC600KD515B or later IC600KD516B or later	OFF
3	Keyboard configuration (only)	Touch screen configuration	OFF
4-7	Not used	Not used	ON
8	No key repeat	Automatic key repeat	ON

Serial and Parallel Ports

This section provides a description of the serial and parallel ports of the Mini OIT. Explanations of port operations are also included. The topics covered are:

- Port Configurations
- Serial Port Description
- Parallel Port Description

Port Configurations

There are two ports on the Mini OIT: a serial port and a parallel port. These ports have five different configurations in which they can be used. These configurations are selected from the Configuration menu. The five configurations are:

- Serial port is primary.
- Parallel port is primary.
- Both ports are primary.
- Easy Display
- User Programmable

Serial Port is Primary. This is the most common mode of operation for the Mini OIT. Use this configuration when your application requires operator input (two way communications). The serial port is connected to the host using RS-232 or RS-422 connections. The host transmits characters or escape commands to the Mini OIT. When a sealed membrane keyboard or a full travel keyboard is plugged into the Mini OIT, characters can be transmitted back to the host device. Also, characters can be transmitted from the parallel port. All characters transmitted to the parallel port will be ignored.

A practical application using this operating mode is to connect the Mini OIT's serial port to an intelligent host such as a PLC ASCII/BASIC module. Operator input can be achieved using the touch screen keyboard on the Mini OIT or adding a sealed membrane keyboard. Also with this configuration, a parallel printer can be added.

Parallel Port is Primary. In this configuration, the Mini OIT is connected to the host through the parallel port. The Mini OIT's parallel port can be connected to a host in one of two ways. It can be connected to the host's parallel port, or it can be connected to a host through a 5 volt TTL DC output module such as that found on a PLC. Characters can be transmitted from the serial port. All characters transmitted to the serial port will be ignored.

Parallel and Serial Port are Primary. In this configuration both the serial port and the parallel ports can receive characters. Any characters entered on a touch screen, membrane keyboard, or full-travel keyboard are simultaneously transmitted out both the serial and parallel ports. Because the parallel port requires handshaking signals to be used, this mode with both ports considered to be the primary port should not be used if the device connected on the parallel port is not capable of receiving data.

Easy Display. This configuration is specifically designed so that the Mini OIT can be used as an intelligent stored message display with a parallel interface. The parallel port is connected to the host through a parallel cable. This configuration allows a programmable controller, using only discrete outputs, to initiate the display of screen files on the screen. In addition to displaying stored screen files, alpha-numeric information, binary, or binary coded decimal (BCD) numbers may also be sent to a printer or any other device that has a parallel input port.

User Programmable. In this configuration the Mini OIT can be programmed by the user to select the I/O status of all 16 parallel signal lines. Each line can be either turned on or off at the command of the operator or host device. Contact GE Fanuc Automation for further information.

When the parallel port is used, the Mini OIT will place the data being sent on the port, toggle the strobe handshaking line, and then wait for the acknowledgement signal to toggle. If the Mini OIT sends a character when the host device or peripheral is not operation, it will wait indefinitely for the acknowledgement signal. The user must ensure that either the parallel device connected to the Mini OIT toggles this signal on power-up so that it is able to resume sending new data, or that the Mini OIT is reset whenever any parallel device is turned on. The Mini OIT can be reset through the escape sequence Esc c.

Serial Port Description

The pin definitions for the serial port connector are listed below. An illustration of the 25-pin connector is also shown:

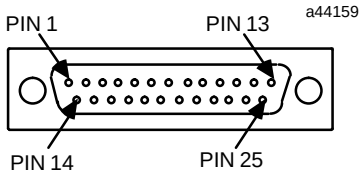


Figure 3-4. Serial Port Using DB-25P Male Connector

Pin	Connection	Pin	Connection
1	Protective(chassis) ground	14	no connection
2	Data Out, RS-232C	15	no connection
3	Data In, RS-232C	16	no connection
4 **(a)**	RTS (Request To Send) output	17	no connection
5 **(b)**	CTS (Clear To Send) input	18	no connection
6	no connection	19	no connection
7	Signal Ground	20 **(d)**	DTR (Data Terminal Ready) out
8	no connection	21	no connection
9 **(c)**	Terminate RX, RS-422	22	Data In (-), RD(A), RS-422
10	Data In (+), RD(B), RS-422	23	Data Out (-), SD(A), RS-422
11	Data Out (+), SD(B), RS-422	24	no connection
12	no connection	25	Terminate RX, RS-422
13	no connection		

Notes: **(a)** Asserted when input buffer space available.

(b) Must be asserted to allow output if you use hardware handshaking. Pin 5 on the serial port is used for hardware handshaking during RS-232C operation. If the host equipment does not support the use of this signal and if software handshaking is not selected, then you must connect pin 5 to pin 20 at the Mini OIT's connector.

(c) Must be connected to pin 25 for point-to-point operation or if this Mini OIT falls at the end of a multidrop line.

(d) Asserted when Mini OIT has power.

Serial Port Operations

The 25-pin D-connector on the rear of the unit conforms to RS-232C standards. These standards define an asynchronous serial interface, its impedances, and its physical connectors. RS-232C standards place all equipment into one of two general categories:

- DTE, or Data Terminal Equipment, includes most terminals, printers, and other peripherals. DTE devices are commonly called "data terminals."
- DCE, or Data Communications Equipment, includes many computers and modems. DCE devices are commonly called "data sets."

The differences between a data terminal and a data set emerge when referring to each device's input and output connectors, such as the signals labeled "transmitted data" and "received data."

A cable wired to a DTE at one end and to a DCE at the other end allows all necessary wires to match pin-for-pin at each end. When you connect a DTE device to another DTE device, or you connect a DCE to a DCE, you must cross one or more pairs of signals for proper operation:

The serial port is configured as a DTE port with signals as shown above. Make sure that your host is either a DCE device or that the connecting cable makes the required signal pair crossovers.

With RS-232C operation, when you connect a DTE device to a DTE device, or a DCE device to a DCE device, the signals on pins 2 and 3 must be cross connected; for example, pin 2 at one device must be connected to pin 3 at the other. Any required handshaking signals must also be cross connected.

The RS-232 standard defines a number of signals in addition to transmitted and received data. Few devices require all signals to be used, and most require only a few signals. Refer to your host equipment manual for additional information about pins and required signals.

Handshaking with RS-232C Signals

The Mini OIT offers a 256-character input FIFO (first in, first out) buffer for receiving and holding characters until the Mini OIT processes them. In some cases, the FIFO buffer is filled faster than the Mini OIT processes the characters.

"Handshaking" allows the receiving device to direct the sending device to stop transmitting data so that the buffer does not overflow. Generally, you are only required to use handshaking at a rate greater than 9600 baud. Two modes of handshaking, software or hardware, can be selected through system configuration.

Software handshaking occurs as follows:

1. When the FIFO buffer receives 128 characters, the Mini OIT sends XOFF, or [Ctrl]-S, to the host computer as a message to stop transmitting. The system loses incoming characters only after the FIFO buffer receives 256 characters.
2. When the Mini OIT processes enough characters so that only 64 characters remain in the FIFO buffer, the OIT sends XON, or [Ctrl]-Q, to the host computer to indicate that it is ready to accept more characters.

You can enable or disable software handshaking via software. On initial power-up, the system disables software handshaking. After you select software handshaking, XON or XOFF codes from the host control the flow of data from the OIT.

The Mini OIT handles hardware handshaking with the following signals:

- The Mini OIT uses the RTS (Request To Send output) signal on pin 4 of the RS-232 interface to indicate when the FIFO buffer can accept additional characters.
- The host asserts the CTS (Clear To Send) signal on pin 5 before the OIT transmits any data.
- The Mini OIT always asserts the DTR (Data Terminal Ready output) signal on pin 20 when power is on.

For either hardware or software handshaking, the host computer must be set up to handle the handshaking information. If the host computer does not support handshaking signals, set the Mini OIT for hardware handshaking, and jumper the DTR

output (pin 20) to the CTS input (pin 5) on the Mini OIT. Then, the host ignores the RTS signal from the Mini OIT. The Mini OIT cannot control the flow of data from the host in this situation, so the application program must be written to ensure that the input buffer on the Mini OIT does not overflow.

Handshaking with RS-422 Signals

The Mini OIT does not support the hardware handshaking signals described above as equivalent RS-422 signals. With RS-422 signals, the Mini OIT supports software handshaking when you select it. You should select hardware handshaking if the host supports no handshaking; also you should install jumpers as shown in the wiring diagrams for RS-422 Point-to-Point connections.

Do not to connect both RS-232 and RS-422 inputs on the serial port. You can, however, use both RS-232 and RS-422 outputs on the serial port. To use both outputs, make sure that extra signals from the host equipment are not connected to RS-422 pins during RS-232C operation and, similarly, that extra signals from the host equipment are not connected to RS-232C pins during RS-422 operation. Refer to the information under the "Multidrop Operations" heading below for information on the use of the Mini OIT using a multidrop RS-422 network.

You must connect RS-422 receiver termination pins at the Mini OIT when using it in a point-to-point configuration. In multidrop configurations, you must connect the termination pins at the Mini OIT farthest from the host:

- You can use the Mini OIT's internal termination resistors by connecting pin 9 to pin 25.
- You can use or may be required to use external termination resistors for proper RS-422 operation. External termination resistors are nominally 100 ohms, depending on cable characteristics. At the Mini OIT, connect a resistor between pin 10 and pin 22. At the host, connect a resistor between its Data In(+)RD(B) and Data In(-)RD(A) pins.

Consult your host equipment supplier for additional information.

Serial Cable and Connector Specifications

The following list provides the specifications for the construction of cables to connect the Mini OIT to a host device:

- Cable connector to serial port: Female, D-subminiature type, Cannon DB-25S with DB110963-3 hood or equivalent (standard RS-232C connector).
- Maximum cable length: 50 feet (15 meters) for RS-232C; 4000 feet (1200 meters) for RS-422.
- Overall shield: Recommended. Tie the shield to the chassis ground at one end only. See the wiring diagrams below for more information.
- Minimum wire specification: 24 AWG.
- Cable recommendations: The Belden 9184, the Belden 9302, and the NEC 222P1SLCBT cables provide acceptable operation at data rates of up to 19.2K baud and distances of up to 4000 feet for RS-422 ports.

Refer to your application or device manual for additional information about connections to the host or peripherals.

When using the RS-422 port, you should match the twisted pairs so that both transmit signals make up one twisted pair and both receive signals make up the other twisted pair. If you ignore this crossover, cross talk affecting the performance of the communication system can result from the mismatching.

Caution

When routing communications cables outdoors, use transient suppression devices to reduce the possibility of damage due to lightning or static discharge.

Also, make sure that both the OIT and the host device to which the Mini OIT is connected are grounded to a common point. Failure to provide a ground can result in serious damage to the equipment if the potential exceeds the isolation voltage rating of the equipment.

Typical Serial Cable Wiring Configurations

This section contains serial cable wiring diagrams for the Mini OIT.

- The diagrams do not cover all possible configurations; but by using the Mini OIT port connector definitions and the manual for the DTE or DCE device connected to your Mini OIT, you should be able to configure the cable for your application.
- All signals, with the exception of the protective ground, are optically isolated from the Mini OIT internal logic.

The diagrams appear below:

Figure 3-5. RS-232C Point-to-Point Communication with Handshaking (Mini OIT Serial Port to Series Six ASCII/BASIC Module Port 2)

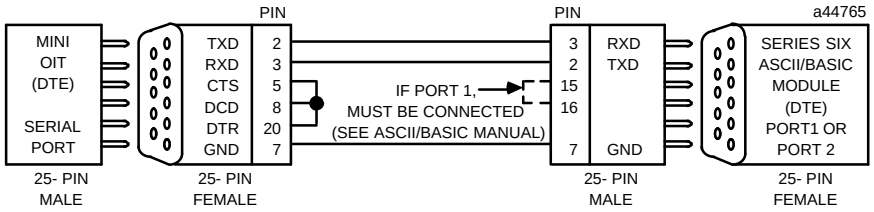


Figure 3-6. RS-232C Point-to-Point Communication, No Handshaking (Mini OIT Serial Port to Series Six ASCII/BASIC Module Port 1 or Port 2)

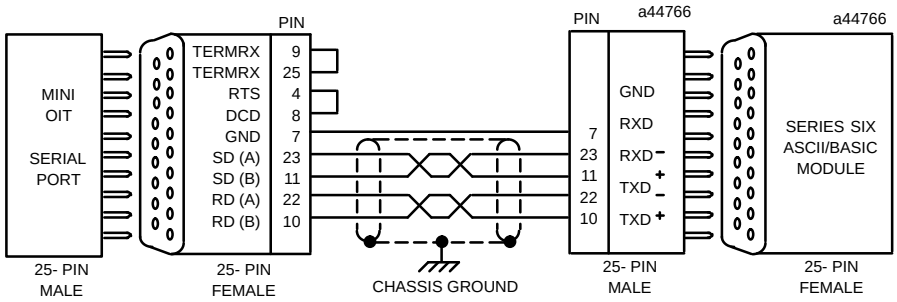


Figure 3-7. RS-422 Point-to-Point Communication (Mini OIT Serial Port to Port to Series Five ASCII/BASIC Module Port 1 or Port 2)

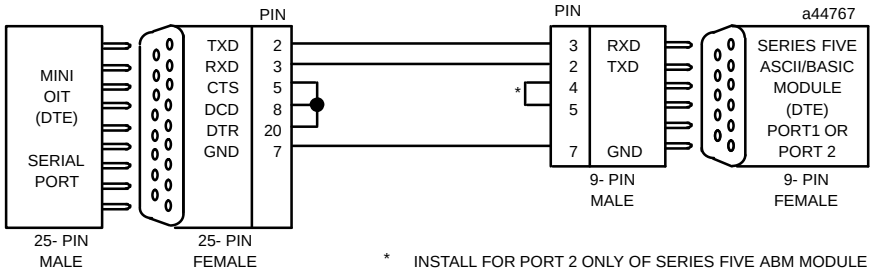


Figure 3-8. RS-232C Point-to-Point Communication, No Handshaking (Mini OIT Serial Port to Series Five ASCII/BASIC Module Port 2)

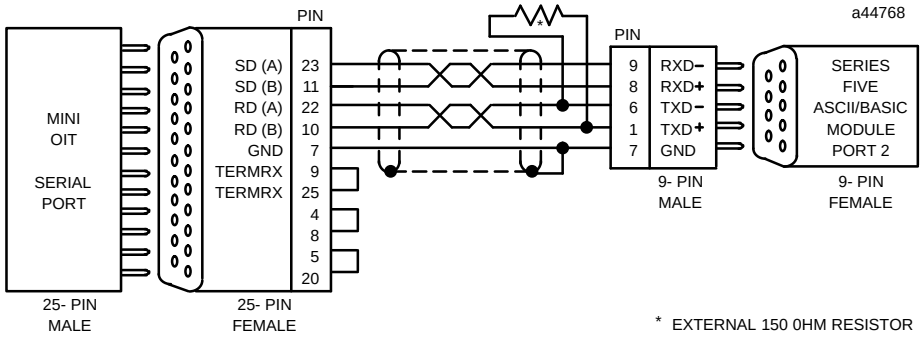


Figure 3-9. RS-422 Point-to-Point Communication, No Handshaking (Mini OIT Serial to Series 90-70 PCM Module Port 1 or Port 2)

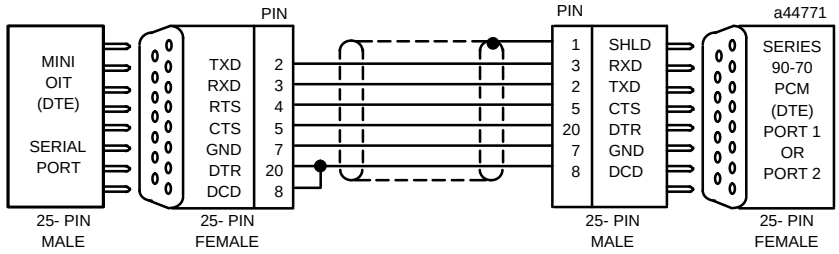


Figure 3-10. RS-232 Point-to-Point Communication with Handshaking (Mini OIT Serial Port to Series 90-70 PCM Module Port 1 or Port 2)

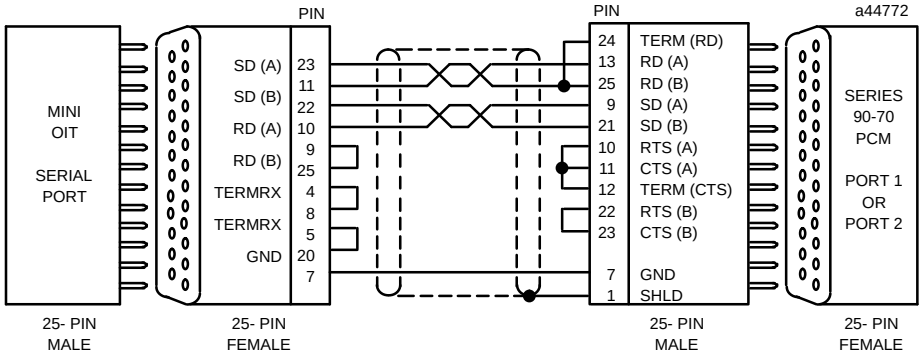


Figure 3-11. RS-422 Point-to-Point Communication with Handshaking (Mini OIT Serial Port to Series 90-30 PCM Module Port 1)

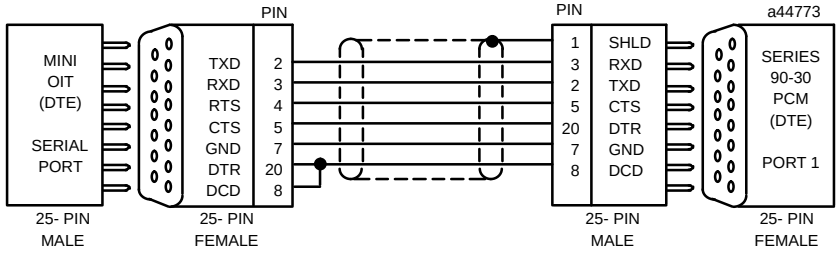


Figure 3-12. RS-232 Point-to-Point Communication with Handshaking (Mini OIT Serial Port to Series 90-30 PCM Module Port 2)

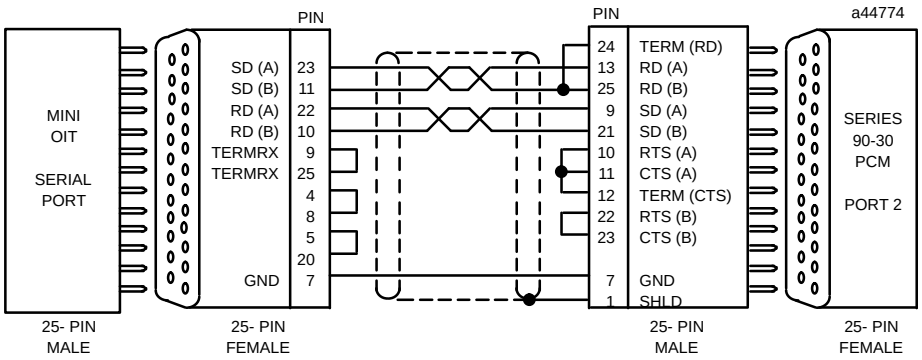


Figure 3-13. RS-422 Point-to-Point Communication (Mini OIT Serial Port to Series 90-30 PCM Module Port 2)

Multidrop Operations

The Mini OIT is designed with RS-422 interfaces so that a number of units can be linked on a multidrop line. Multidrop protocol messages are completely interrupt driven, reducing the delay between the end of the message and the time that the Mini OIT places its transmitter in a high impedance state. This permits a host to poll a number of slaves with minimum delay between polls.

Configuring the Mini OIT

Once you select *Multidrop* operation in the Configuration Menu, the system requires you to specify an address between 00 and 99. Although addresses may fall between 00 and 99, you are limited to a maximum of 16 slaves, depending on cable lengths, connection quality, and the communications baud rate. The 00 to 99 address identifies one of the 16 Mini OITs for later operations. On power up, or when first selecting multidrop operation, the OIT automatically disables itself from receiving or transmitting data.

When you select *Multidrop* operation in the Configuration Menu, the Mini OIT automatically selects *Software* handshaking and *Echo* operation.

- *Software* handshaking uses the XON (or DC1) and XOFF (or DC3) codes to prevent transmission overruns. RS-422 multidrop operation requires this method since it does not offer RTS and CTS signals. Also, RS-422 multidrop operation does not allow the ”message data” to use the DC1 or DC3 codes.
- *Echo* operation displays operator keystrokes on the screen immediately, even though the host has not yet received the data.
- For special requirements, or when the polling of Mini OITs takes place at high speeds, *No Echo* operation can be used. The host, however, must select *No Echo* mode by sending the Mini OIT the appropriate escape sequence.

You, the user, can select *hardware* handshaking. With the multidrop protocol, hardware handshaking operates the same as no handshaking, allowing you to use the protocol itself as a form of handshaking:

- When the system polls a slave, the slave transmitter is enabled from the time the system receives the address until the system receives the end of message code. If the system receives the end of message code while the slave is still transmitting, the system turns the slave transmitter off and the slave saves the remaining data in the output buffer. When the slave receives the next polling message, it continues the transmission.
- In a single poll, the slave can transmit the same approximate number of characters as the number of character frame times between the slave address and the end of message code. At a minimum, this time is the same as the number of characters transmitted as data from the host to the slave. The host may also designate a delay between sending the slave address and the end of message code.

After configuring the Mini OIT with the communications specifications for your application, enter into *ONLINE* mode.

Wiring for RS-422 Communications

You should make sure that extra signals from the host equipment are not connected to RS-422 pins during RS-232C operation and, similarly, that extra signals from the host equipment are not connected to RS-232C pins during RS-422 operation.

When a Mini OIT has not been selected during multidrop operation, its transmit signals are put in a high-impedance state. The host computer may require you to connect pull-up and pull-down resistors to its receive signals to avoid spurious data when no Mini OIT has been selected for operation.

Support of RS-422 signals by a host device does not guarantee a multidrop configuration. The host must be able to drive the receiving circuitry of all connected devices. Moreover, to effectively support multiple Mini OITs, the host software must be capable of polling and keeping track of communications with all the Mini OITs in an orderly manner, and usually on a real-time basis. Consult the supplier of your host device for additional information.

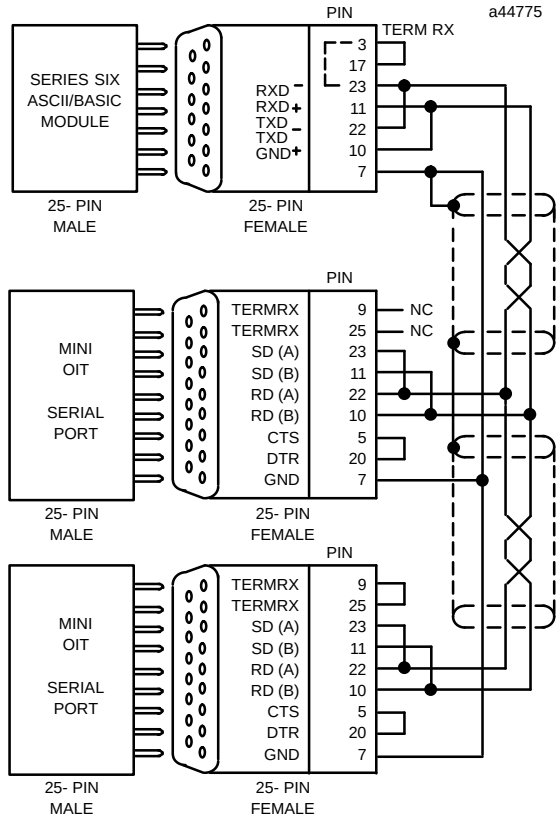


Figure 3-14. RS-422 Multidrop 2-Wire (Mini OIT Serial Port to Series Six ASCII/BASIC Module)

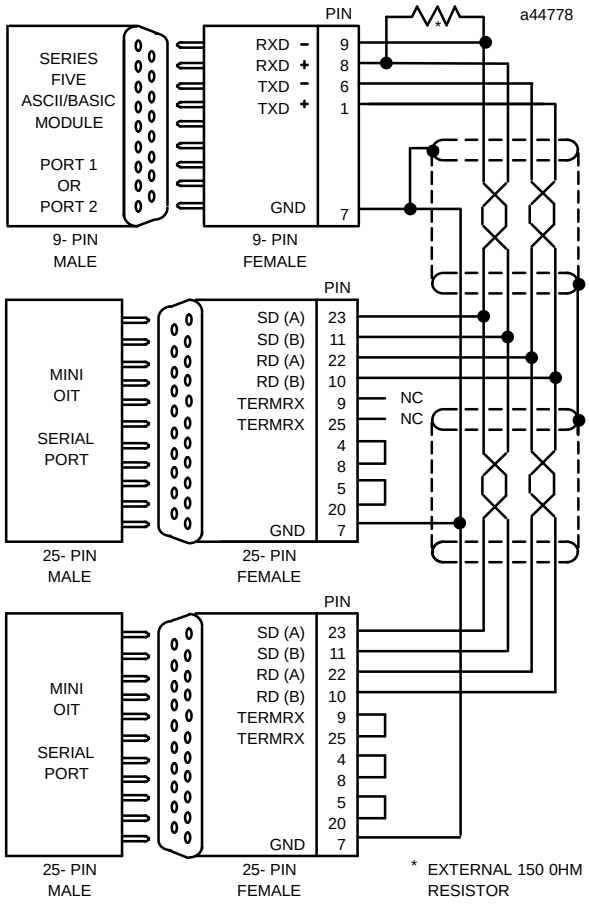


Figure 3-15. RS-422 Multidrop 4-Wire (Mini OIT Serial Port to Series Five ASCII/BASIC Port 2)

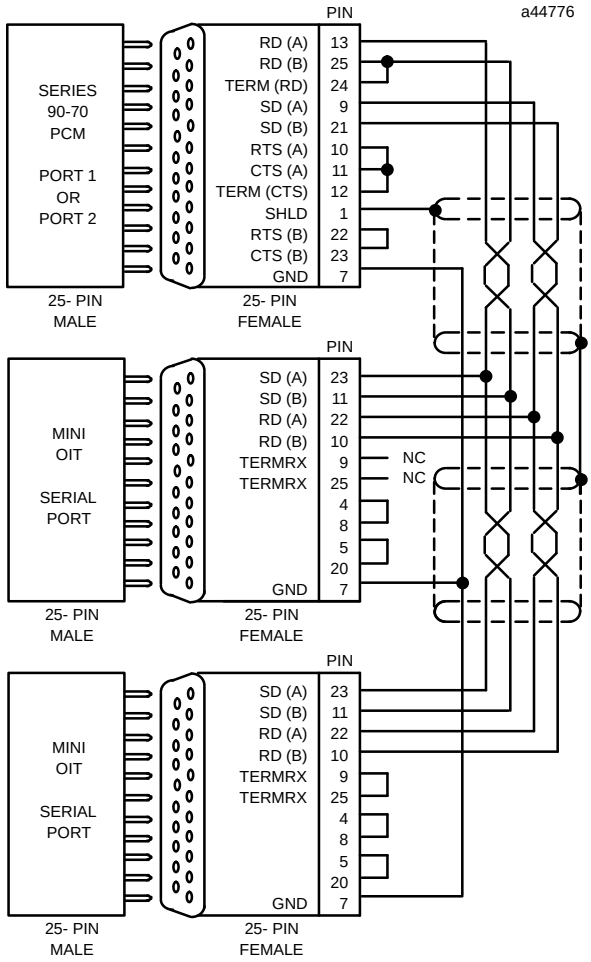


Figure 3-16. RS-422 Multidrop 4-Wire
(Mini OIT Serial Port to Series 90-70 PCM Module 90-70 PCM Module Port 1 or Port 2)

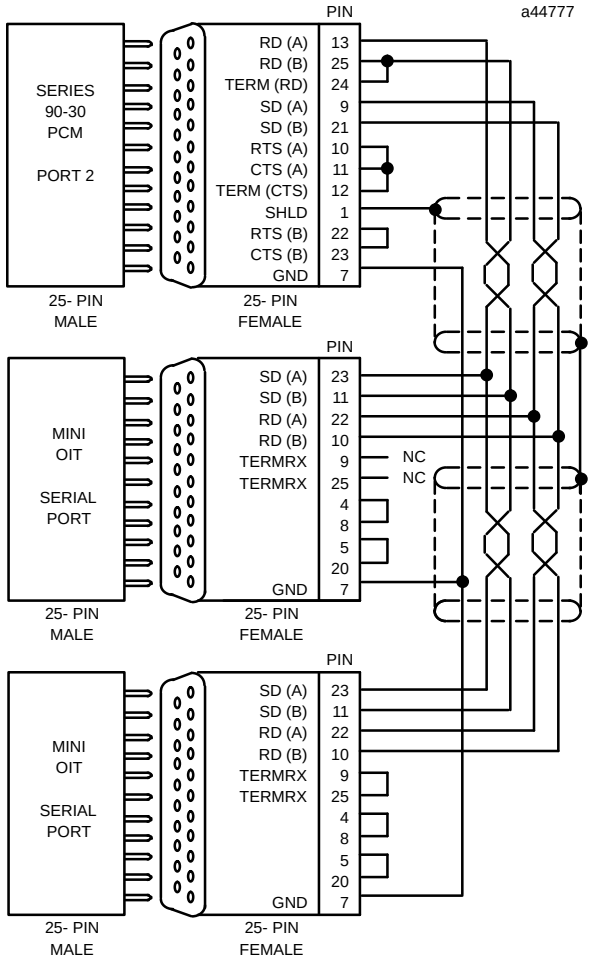


Figure 3-17. RS-422 Multidrop 4-Wire (Mini OIT Serial Port to Series 90-30 PCM Module Port 2)

How Multidrop Operation Works

A typical sequence for a host device to poll a series of RS-422 slaves appears below:

1. To enable the Mini OIT for both transmission and reception, the host sends [Ctrl]-P (Data Link Escape, or ASCII code 16) followed by the two digit address for the desired Mini OIT. The address appears in standard ASCII format and uses two digits; for example, the system addresses Mini OIT 5 as 05. For example, the host transmits the following ASCII codes:

   16 48 49

   ASCII code 16 is [Ctrl]-P. ASCII code 48 is 0. ASCII code 49 is 1. This sequence initiates communications with slave 1.

2. The system transmits the "message string" to the host. The system displays keyboard entries on the screen and stores them for subsequent transmission. The system stores a maximum of 256 characters before it loses data. Once you select a Mini OIT, any keyboard entries being stored are automatically transmitted as the message string, and normal operation (as if point-to-point connection were in effect) takes place between the host and the Mini OIT.

3. The host transmits a series of escape sequences to the slave.

4. The host can subsequently disable a Mini OIT by sending [Ctrl]-W (End of Transmission Block, or ASCII code 23). For example, two-way communication continues until the hosts transmits the following ASCII code:

   ```
   23
   ```

   ASCII code 23 is [Ctrl]-W. This sequence ends communications with slave 1.

5. Continuing, the host transmits the following ASCII codes:

   ```
   16 48 50
   ```

   ASCII code 16 is [Ctrl]-P. ASCII code 48 is 0. ASCII code 50 is 2. This sequence initiates communications with slave 2.

And so on, until all of the multidrop devices have been polled.

The system automatically enables a Mini OIT with the address 00 to receive data addressed to any Mini OIT, but the Mini OIT is not enabled to transmit unless the host specifically transmits the 00 address. If the host transmits the address 00, all Mini OITs are enabled to receive data, but only OIT 00 (if it exists) is enabled to transmit data.

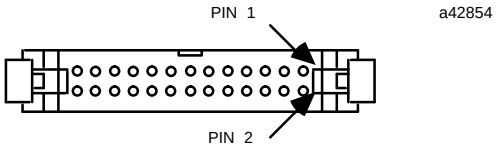
Multiple Mini OITs may use the same address, but only one Mini OIT with the given address may be electrically connected to transmit data.

Similarly, more than one address may be enabled at the same time. Simply transmit the enabling code for an address (without an intervening [Ctrl]-W code), followed by the message string for the address; then transmit the enabling code for an address, followed by a message string, and so on. Again, however, only one Mini OIT may be electrically connected for transmitting data.

The Mini OIT uses the control codes for enabling and disabling ports in the same sequence as it does for all other commands and characters. Therefore, the system processes all commands and characters it receives before it executes a command to relinquish the multidrop link. Also, the host command to establish a new connection cannot be sent until the Mini OIT relinquishes the previous connection. Therefore, you may be required to specify a delay between turning off one Mini OIT and turning on another to prevent more than one Mini OIT from operating simultaneously. The Mini OIT holds up to 255 characters in its buffer and generally processes over 1000 characters per second; therefore, a 1/8th second delay (0.125 second) should be adequate unless you send a complex escape sequence, such as a screen display.

Parallel Port Description

The connector definitions for the parallel port connector are provided below.



PIN		PIN	
1	Shield	14	Txmit Ready (Input)
2	Ground	15	Txmit Clock (Output)
3	Ground	16	Txmit Bit 0
4	Recv Ready (Output)	17	Txmit Bit 1
5	Recv Clock (Input)	18	Txmit Bit 2
6	Recv Bit 0	19	Txmit Bit 3
7	Recv Bit 1	20	Txmit Bit 4
8	Recv Bit 2	21	Txmit Bit 5
9	Recv Bit 3	22	Txmit Bit 6
10	Recv Bit 4	23	Txmit Bit 7
11	Recv Bit 5	24	Vcc (+5 V dc)
12	Recv Bit 6	25	Vcc (+5 V dc)
13	Recv Bit 7	26	Vcc (+5 V dc)

Notes:

- All signals are TTL level, limited to one standard TTL load.
- Recv Data Bits and Txmit Data Bits are active high signals.
- Recv Clock is an active high input pulse that indicates that Data is valid. Data is loaded from the peripheral on a low to high transition. Data must be present for 150 nS prior to this transition.
- Recv Ready is an active high output signal that indicates new data may be transmitted to the Mini OIT.
- Txmit Clock is an active high output pulse that indicates that Data is valid. New data is loaded onto the data output lines on a low to high transition. It is reset to a low state upon the high going transition of the Txmit Ready signal.
- Txmit Ready is an active high input pulse that indicates on a low to high transition that the Mini OIT is ready to transmit data to the peripheral.
- An input low voltage signal must be between -0.3 and +0.8 V dc.
- An input high voltage signal must be between 2.0 and 5.0 V dc.
- An output low voltage signal will be a maximum of 0.4 V dc, and is capable of sinking a maximum of 2.0 mA.
- An output high voltage signal will be a minimum of 2.4 V dc, and is capable of sourcing a maximum of 250 mA.

Figure 3-18. The Parallel Port Connector

Parallel Port Operation

The parallel communications port allows communication to hosts that do not support a serial interface but instead support discrete digital inputs and outputs.

All data received from the parallel port is stored in the receive buffer of the Mini OIT simultaneously with data received on the serial port. Likewise, all data transmitted by the Mini OIT will simultaneously be sent through both the serial and parallel ports.

The parallel port therefore is capable of transmitting and receiving full ASCII data, and 8 data bits are available in both directions. All Mini OIT commands implemented can be sent over the parallel port, and all data transmitted will be the equivalent ASCII data.

In actual operation, it is not required that all 8 data bits be controlled by the host. For instance, only 7 bits are actually required for ASCII data, and depending upon the type of data being used, fewer bits may be required.

For example, if the letters A-O only are used, the output on the parallel port would be the hex codes 41 through 4F. As can be seen, only the lower 4 bits will change based upon the key pressed, and the user could connect only these 4 signals to the host and perform the decoding of that data fairly easily within even the simplest of PLCs or other hosts.

Handshaking

The parallel port has two sets of handshaking lines that can be used to control the transfer of data. These signals called BUSY and STROBE are used to indicate when data is valid, and when the sending device is allowed to transmit subsequent data.

Because the data being placed on a parallel interface may not have all bits valid simultaneously, the method of operation calls for a STROBE signal to be toggled after the data is valid. This tells the receiving device that the data can be used.

The receiving device has the option of setting the BUSY signal active while it is processing a newly received character so that new data does not overwrite data being processed.

Using the Screen Display and Data Fill Command with the Parallel Port

For a host with full ASCII capabilities, sending complex escape sequences is generally no more difficult than sending simple data. For less intelligent hosts, implementing an interface using the parallel port to send complex sequences may prove difficult. One feature that has been specifically developed to avoid this problem is the Screen Display and Data Fill command.

The Screen Display and Data Fill command, described in Chapter 5, allows the user to recall a pre-stored screen and imbed data at specific locations on the screen without the need for cursor positioning commands and many other graphic commands. Using the serial port, this command still requires a complete escape sequence. For the Mini OIT, this command will automatically be performed by setting the 8th bit on the parallel port and using the lower bits to indicate the file to display and fill.

In this manner, up to 128 files can be accessed using a single byte command.

Easy Display Mode

The Mini OIT can be used as an intelligent stored message display with a parallel interface. The parallel controlled message display mode is enabled via the Configuration screen. This mode allows a programmable controller, using only discrete outputs, to initiate the display of informative and easy to read messages on the alpha-numeric information, binary, or binary coded decimal (BCD) numbers may be input and displayed in the messages. Messages and numbers may also be sent to a printer or any other device that has a serial input port.

Table 3-1. Parallel Port Connections for Easy Display Mode

PIN	BIT	FUNCTION	
6	0	D0	Data 0
7	1	D1	Data 1
8	2	D2	Data 2
9	3	D3	Data 3
10	4	D4	Data 4
11	5	D5	Data 5
12	6	D6	Data 6
13	7	D7	Data 7
16	8	DKS0	Data Kind Select 0
17	9	DKS1	Data Kind Select 1
18	10	NL0	Numeric Length 0
19	11	NL1	Numeric Length 1
20	12	NEG	Negative
21	13	ZS	Zero Suppress
22	14	PRNT	Print
23	15	DV	Data Valid

Data Inputs 0-7. The Mini OIT will interpret the inputs on lines D0-D7 as alpha-numeric characters or MESSAGE, BCD, or BINARY numbers depending on the status of the Data Kind Select signals. All data signal inputs will be discrete binary numbers. Alpha-numeric, Binary, and BCD-Format data are displayed and used as file fill data. Alpha-numeric data uses the same codes listed in Appendix B.

The MESSAGE number selects a MESSAGE (screen file) to be displayed. The MESSAGE number is interpreted as a binary number. BCD data is in packed BCD format, and is displayed as a decimal number. A single byte may have values from 00 to 99. Binary data is displayed as received, and may have a single byte value from 0 to 255.

Data Kind Select 0 and 1. These lines determine which kind of data is being input.

Table 3-2. Data Kind Selections

DKS1	DKS0	KIND OF DATA
LOW	LOW	Alpha-numeric (ASCII) character
LOW	HIGH	MESSAGE (screen file) number (interpreted as binary)
HIGH	LOW	BCD number (also hexadecimal)
HIGH	HIGH	BINARY number

Note

When BCD is selected, digit codes which are greater than 9 are displayed as hexadecimal characters A to F.

Numeric Length 0 and 1. These lines determine how many bytes will be input to form a number. Used only for BCD and BINARY numbers.

Table 3-3. Numeric Data Length Selections

NL1	NL0	NO. BYTES
LOW	LOW	1 Byte
LOW	HIGH	2 Bytes
HIGH	LOW	3 Bytes
HIGH	HIGH	4 Bytes

The most significant byte of a numeric value is input first, the least significant byte is input last. The number is converted to an ASCII encoded numeric value when this least significant byte is received. Note that the length of the converted numeric value is determined by the number of bytes that are received. The state of NL1 and NL0 when the first byte of a numeric value is received determines how many bytes are to follow. If all numbers are to have the same number of bytes then NL1 and NL0 can simply be held at the constant levels which well reflect the selected numeric length.

Negative. Indicates to the Mini OIT numeric formatter that a minus sign should be displayed with the number. It is used only with BCD or BINARY data. This signal should be presented along with any byte of the number. It is asserted when the signal is HIGH.

Zero Suppress. When a HIGH signal is present on this line, it indicates to the Mini OIT numeric formatter that leading zeros of the numeric value should be replaced with spaces. This function may be used only with BCD or BINARY data. This signal should be presented along with any byte of the number.

Print. This signal, when high, causes data received from the host device to be output via the Mini OIT serial port instead of displayed on the screen. A hardcopy printer or any other device with a serial interface may be connected.

Data Valid. Data is input while this signal is high. If the signal is low, no data will be read even if the data changes. While the signal is high the data is polled for changes. If the data changes and then is read without changing for a period of (filter time) milliseconds, the data is then input and used. The DATA VALID signal can simply be held high if the connected device is able to complete the update of all signals within (filter time) milliseconds. By driving the DATA VALID signal low, performing the data update, holding DATA VALID high for at least (filter time) milliseconds, and then returning DATA VALID to LOW, the rate of update can be controlled by the connected device. See the note on Noise Rejection De-Bounce Logic below for an explanation of filter time.

The Mini OIT Numeric Formatter determines how the BCD and BINARY values are displayed. All numeric values are converted to an ASCII encoded decimal number before being displayed. The length of the ASCII encoded data field is determined by the most significant byte input and the data kind (BCD or BINARY).

Table 3-4. Length of ASCII Encoded Data

DATA KIND	NO. BYTES INPUT	LENGTH OF EDITED NUMBER
BCD	1	2
BCD	2	4
BCD	3	6
BCD	4	8
BINARY	1	3
BINARY	2	6

The edited length is the number of data fill characters that should be included in a message (screen file) for each number to be correctly inserted during the data fill operation.

Zero suppression will replace leading zeros with spaces but will not change the length of the edited number. The minus sign will be placed in front of the most significant digit. The minus sign does not change the length of the edited number. The minus sign may replace the most significant digit if the number is too large. One way to avoid this is to input one more byte of the number than is required for the number of digits. This most significant byte will be zero so that there will be room for the minus sign in the edited field. If the first character of a negative number is a non-zero digit, an asterisk will replace this digit to indicate that the number is negative and that the most significant digit was overwritten.

The maximum BCD number is 99999999. The maximum binary number is 65535.

Note on Using BCD for Message Numbers: While message numbers are always processed as binary values, it is possible to use BCD codes. The maximum BCD message number is 99. Since the Easy Display interprets this as a binary value the corresponding stored message is number 153.

Table 3-5. Calling Up Messages Using BCD

BCD MESSAGES NUMBERS	INTERNAL MESSAGE NUMBERS
00 to 09	0 to 9
10 to 19	16 to 25
20 to 29	32 to 41
30 to 39	48 to 57
40 to 49	64 to 73
50 to 59	80 to 89
60 to 69	96 to 105
70 to 79	112 to 121
80 to 89	128 to 137
90 to 99	144 to 153

Note on the Noise Rejection De-Bounce Logic: Parallel input data is polled 960 times per second or about every 1.04 milliseconds. When Easy Display mode is selected on the Configuration screen, a filter time is also displayed. This number represents the number of poll times that the input data must be read without changing before the data is accepted as valid information. This value can be set from 1 to 255 for noise filter times from 1.04 milliseconds to 266 milliseconds.

Parallel Port in User Programmable I/O Mode

The Mini OIT can be programmed by the user to select the I/O status of all 16 parallel signal lines. Each line can be either an input or output, and can be turned on or off at the command of the operator or host device.

Note

The text below describes the basic operation of the User Programmable I/O Mode. It is recommended, however, that you consult GE Fanuc Automation to assist you in developing your specific application using this mode.

I/O mode data, input data, and output data are all processed as a decimal number used as a parameter in the escape sequence or OptiSCREEN command. The decimal number may have a value from 0 to 65535 and is processed as a 16-bit binary value by the terminal. Each bit of the binary value corresponds to a discrete signal on the parallel port connector.

Table 3-6. Parallel Port Bit Values for User Programmable I/O Mode

PIN	BIT	DECIMAL VALUE
6	0	1
7	1	2
8	2	4
9	3	8
10	4	16
11	5	32
12	6	64
13	7	128
16	8	256
17	9	512
18	10	1024
19	11	2048
20	12	4096
21	13	8192
22	14	16384
23	15	32768

Note that the READY and CLOCK handshaking signals that are required for normal parallel operations are not used during User Programmable I/O mode.

In Local mode, Escape sequences may be entered using a keyboard. In On-Line mode, the Escape sequences are received at the parallel connector.

For both Input and Output operations, a data bit value of zero represents an "Off" state, and the TTL level at the parallel connector will be "low". A bit value of one represents the "On" state, and the TTL level will be "high".

Initializing User Programmable I/O Mode

To initialize the User Programmable I/O Mode, use either the OptiSCREEN command, PARALLEL I/O MODE: Pn or the equivalent Escape sequence explained below.

PARALLEL I/O MODE: nnn nnn is the numeric parameter which determines the input / output mode of each discrete signal. If nnn is 0 (zero), all 16 signals will be used as outputs. If nnn is 65535 (maximum value), all signals will be used as inputs. For example, if nnn is 28 (4 + 8 + 16) bits 2, 3, and 4 will be inputs and all others will be outputs.

Esc [>nnnp This escape sequence is equivalent to the OptiSCREEN PARALLEII / O MODE command.

Esc [>p This escape sequence is the same as above except that all 16 signals are used as inputs.

The PARALLEL I / O MODE command or equivalent escape sequence automatically turns off any signals that were programmed as outputs.

Inputting Parallel Data

To input the status of the discrete signals use either the INPUT PARALLELDATA command or the equivalent escape sequence as explained below.

INPUT PARALLEL DATA This OptiSCREEN command reads the On / Off status of the 16 signals as a decimal number.

Esc [>i This escape sequence performs the same operation as the OptiSCREEN command.

Esc [>nnni When this escape sequence is used is received, the value of nnn is displayed.

Outputting Parallel Data

To output parallel data, use the OUTPUT PARALLELDATA: nnn command or the equivalent escape sequence as explained below.

OUTPUT PARALLEL DATA: nnn This OptiSCREEN command outputs data based on the decimal value (nnn) explained before. For example, if bits 0 through 7 have been set up as outputs and all bits are 0 except bit 7, the decimal value of nnn is 128.

Esc [>nnno This escape sequence works the same as the OptiSCREEN command.

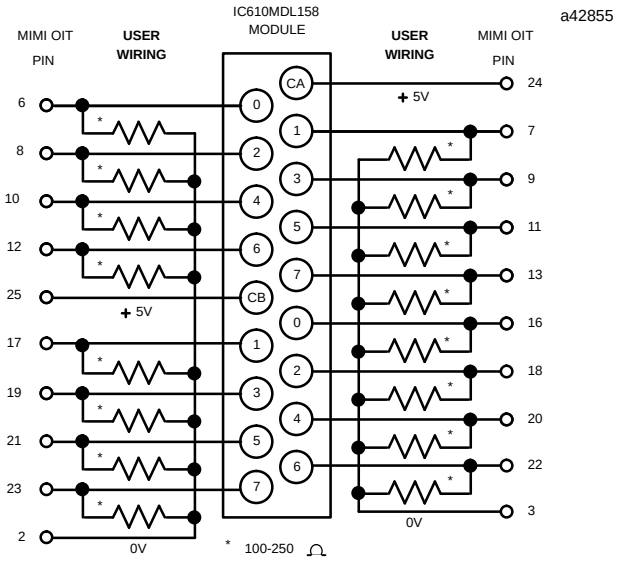
Esc [o This escape sequence turns off all outputs.

The parallel input sequence polls the input status of all 16 signals for a period of debounce time to verify that the signals were not in the process of changing while being read. The signals must be stable for at least the filter time shown on the Configuration Menu.

It is recommended that each output command be followed by an input command to check that the output command was actually received and processed. Since the input command reads the status of all 16 signals, the status of those bits that were programmed for output will represent the value of the last output command processed.

Connecting the Parallel Port to PLC Output Modules

As stated before, the Mini OIT parallel port can be connected directly to a 5-volt TTL output module. The Series Six PLC and Series Five PLC offer this type of module. To connect a Series One PLC to the Mini OIT parallel port, you must use the 24-volt source output module (IC610MDL158) with a 5-volt power supply and pull down resistors as shown in the figure below.



	SOCKET	JUMPER
00	U28	NoJumper
01	U25	W18-W19

If RAM is installed and the jumper is not in the W18-19 position (see Figure 3-20), the RAM will function, but the data will not be battery protected (data will be lost if the Mini OIT is powered off).

The following RAM chip part numbers are recommended for replacing or for adding memory.

- NEC D43256C-12L
- Mitsubishi M5M5256P-12L
- Sony CXK58256P-12L

The figure below shows the memory expansion socket and jumper locations for the Mini OIT.

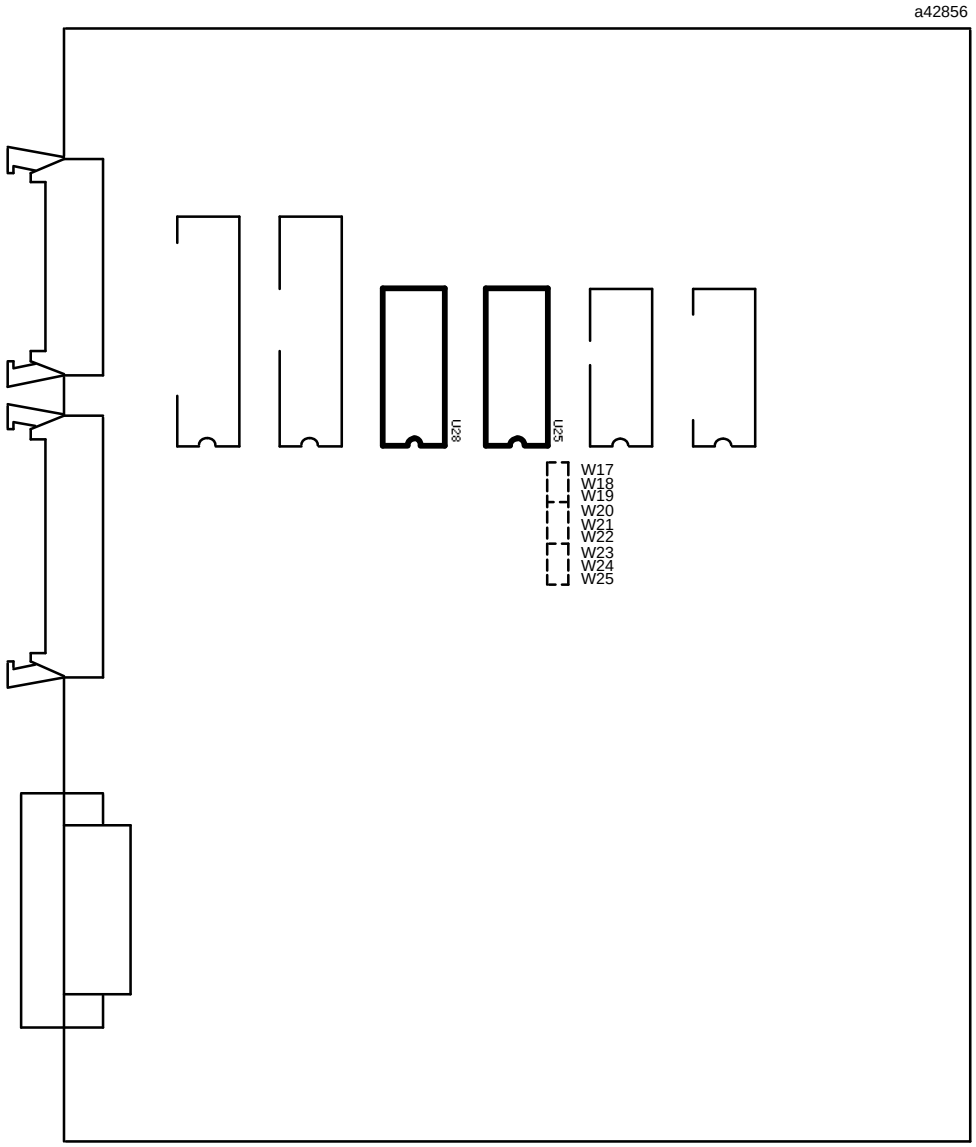


Figure 3-20. Memory Socket and Jumper Locations for the Mini OIT

To add the memory chip for bank 01 follow the procedure below:

1. Unplug the Mini OIT from the main power source.

Warning

High voltages are present in the terminal while power is connected, even if the unit is turned off.

2. Place the Mini OIT face down on a non abrasive surface. Position the unit so the bottom panel of the chassis is toward you.

3. Remove the 10 screws holding the bottom panel of the chassis. The bottom chassis is still connected to the top chassis by two ribbon cables.
4. Unplug the ribbon cables, noting proper location and orientation for later reinstallation.
5. Disconnect the battery before adding or removing memory.

Caution

Adding or removing memory chips while the battery is still connected can damage the chip.

6. Insert the memory chip into socket U25 so that the notch (or dot) at one end of the chip corresponds to the notch at one end of the memory socket.

Caution

The electronic circuitry and memory chips being installed are subject to damage by static electricity. Always ground yourself before you touch the logic board. Keep uninstalled memory chips in their original package until ready for use. Damage to the logic board or the memory chips due to improper handling or installation is not covered by the warranty.

7. Verify that the Memory Power Supply Jumper for socket U25 is in the W18-19 position.
8. Before replacing the bottom of the chassis, verify that all pins of the memory chip are properly inserted into the socket and that the chip is installed with the proper orientation.
9. Reconnect the ribbon cables to the circuit board, and remount the bottom panel of the chassis.

CRT Adjustment

The Mini OIT is a compact, rugged interactive terminal. The 5'' x 9'' CRT is capable of displaying 16 lines of 80 characters each. The figure below shows the front and right side view of the Mini OIT. The right side contains the CRT controls.

Warning

All CRT controls are set at the factory and should need no adjustment. Hazardous voltages are present in the vicinity of the controls. If adjustments do become necessary, they are to be done only by qualified personnel. CRT brightness is controlled by a knob on the rear of the Mini OIT.

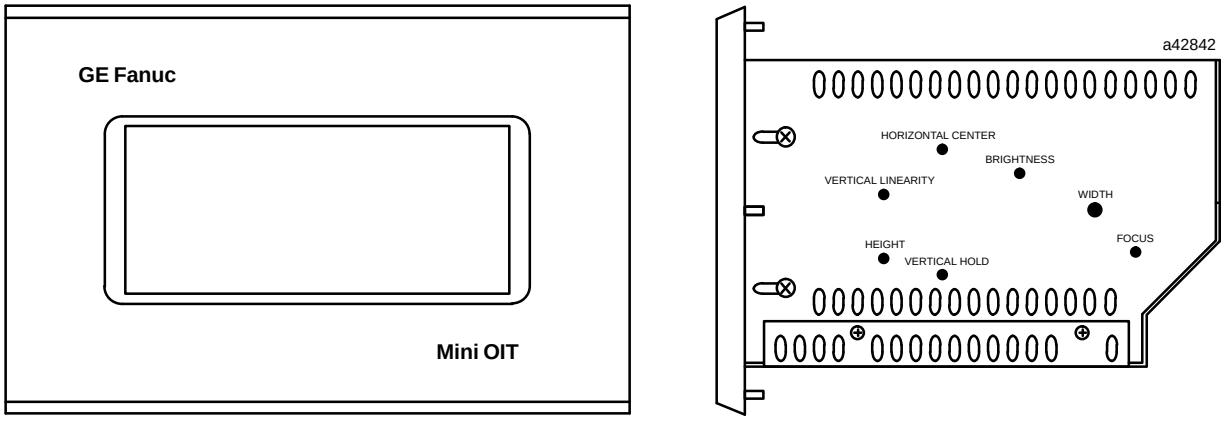


Figure 3-21. CRT Controls for the Mini OIT

Chapter 4 Operation

This chapter describes the system operations of the Mini OIT. Topics covered in this chapter are:

- Modes of Operation
- The Configuration Menu
- The OptiSCREEN Editor Menu
- Keyboard Operations

Modes of Operation

As stated in Chapter 2, ”Getting Started”, there are three modes of operation in which the Mini OIT can power up. Each mode will be discussed here in detail.

On-Line mode: Normal operating mode after installation and program development are complete.

Edit mode: Mode for accessing the OptiSCREEN editor to create screens using English language statements.

Local mode: Mode for creating screens using escape sequences or for testing operation of escape sequences.

The power-up mode is selected in the Configuration menu. If the Edit mode or Local mode has been selected, the Configuration menu will appear after power up and will be displayed for about 30 seconds before the selected mode is entered. If you change an option on the Configuration menu or simply move the cursor, the screen will remain displayed about 4 minutes before entering the selected mode. Any subsequent operation on the Configuration menu will reset the timer.

If the On-line mode was previously selected, the Mini OIT will enter the On-line mode directly after power up, and the Configuration menu will not appear.

If the Mini OIT is already powered up and the selected mode of operation has been entered (On-line, Edit, Local) you can access the Configuration menu by pressing the Control key and the number 1 [Ctrl]-1 on the keyboard simultaneously.

On-Line Mode

The On-Line mode is the normal operating mode after the Mini OIT is installed and ready for normal everyday operations. This is also the mode used for programming a

remote device such as the ASCII/BASIC module. The On-Line mode is especially useful for simulating and testing the communication sequences and protocol used with a remote device.

When the Mini OIT is on-line, any one of 128 ASCII characters can be sent through the serial port to a computer or other intelligent machine. In the On-Line mode, the terminal can be configured for either Echo (half-duplex) or No-Echo (full-duplex) operations. In Echo mode, the character sent will also be displayed on the screen. In the No-Echo mode, the host computer or programmable controller must return the character before it is displayed. However, some of these characters will not be displayed if the computer sends them back to the Mini OIT. ASCII characters 0-31 are non-displayable characters. Most applications will use No-Echo operations.

Edit Mode

The Edit mode is used to access the OptiSCREEN Editor. The OptiSCREEN Editor is used to create screen formats to make the display of data easy to read. The screen formats are programmed using English language commands instead of the Escape sequences required for Local Mode operation. These commands enable you to control where data is placed on the screen and what the appearance of the data will be. There are also commands which allow you to call other programmed screen files.

The screen format usually consists of the screen title, explanations of the dynamic data sent by the host, and any graphics such as lines and boxes used to clearly present the data.

Local Mode

Local mode can be used to practice creating the various escape sequences which are to be sent by the host to the Mini OIT in On-Line operation. Local mode can also be used for screen creation (although the OptiSCREEN Editor is normally used to create screens). When the unit is in Local mode, no characters are transmitted, but are displayed directly on the screen. Cursor controls and escape sequences are processed immediately by the unit.

Note

Escape sequences are a combination of the ASCII code 1B (hex)/27(dec), which is the code for the Escape key (Esc), followed by one or more additional characters. Escape sequences are normally sent by the host to the Mini OIT and Escape sequences are used to change screen attributes, move the cursor, store and recall screens, plus many other operations.

The ASCII Characters and Escape Sequences listed in the appendices show the commands and special escape sequences that the Mini OIT supports. Your computer-based system must contain the proper software for it to respond to and send the codes that use these special functions. Different versions of software may support different features.

The Configuration Menu

The Mini OIT has several data communication formats and many useful operating features. Data communication format options include baud rate selection, type of parity,

word length, and number of stop bits. Operating features and options include Echo (half-duplex) or No-Echo (full duplex) operation, escape sequence mode (ANSI, VT-100, or VT-52), cursor type, and others. Many features can be invoked through escape sequences; all can be invoked through the menu-driven Configuration menu.

Accessing the Configuration Menu

The Mini OIT can be configured to power up into the On-Line, Edit, or Local mode. The power-up mode is selected in the Configuration menu. If the Local mode or Edit mode has been selected, the Configuration screen will appear after power up and will be displayed for about 30 seconds before the selected mode is entered. If you change an option on the Configuration menu or simply move the cursor, the screen will remain displayed about 4 minutes before entering the selected mode. Any subsequent operation on the Configuration menu will reset the timer.

If the On-line mode was previously selected, the Mini OIT will enter the On-line mode directly after power up, and the Configuration menu will not appear.

Note

If the Mini OIT is already powered up and the selected mode of operation has been entered (On-line, Local, Edit) you can access the Configuration menu by pressing the Control key and the number 1 [Ctrl]-1 on the keyboard simultaneously.

Whenever the Configuration menu is entered (through [Ctrl]-1, or Power-Up, or System Reset), the following operations occur:

- Any IBM PC-XT compatible keyboard that is connected at that time will be re-initialized. (Remember, this turns off CAPS LOCK and NUMERIC LOCK.)
- Any file storage operation will be aborted. Any previous version of a file that was saved will be retained.
- All screen attributes will be reset.
- All screen data will be lost, and input / output buffers cleared.
- Line attributes will be retained.

Touch Configuration

When DIP switch #3 (see Chapte 3 for discussion of DIP switches) is in the “OFF” position, the lower four lines of the Configuration menu have graphics for seven touch boxes that may be used as function keys F1-F7. The touch boxes may be used to move the configuration indicator to a configuration option or to select, perform or exit from the menu. In this mode the terminal may be configured without the use of an XT keyboard, though the keyboard will still be required to use the built-in OptiSCREEN editor. With DIP switch #3 is in the “ON” position the touch screen CANNOT be used to configure the terminal; an XT keyboard MUST be used.

Sample Configuration

A sample Mini OIT configuration is displayed below. The box at the top of the screen describes the revision and release levels and the release date for the firmware contained in the unit. At the left side of the screen is a list of the various modes and functions that may be selected. These correspond to the status messages shown on the same row at the right side of the screen. The box at the bottom of the menu describes the operations which can be performed while in the Configuration mode, and the keys that may be used to perform them.

```
      Ge Fanuc Operator Interface Terminal          Rel 2.5-32    060ct93
OPERATION                                  LOCAL      ANSI  NO ECHO  SEND ANY CASE
END LINE/COLOR                             NO WRAP  NO AUTO LF
CURSOR/SCREEN                              BLINKING BLOCK       CRT SAVER OFF
KEY CODES                                  THREE
SERIAL PORT                                9600   EVEN  7 BIT 1 STOP HARD  PT TO PT
PARALLEL PORT MODE                         PARALLEL IS AUXILIARY, SERIAL IS PRIMARY
CONFIGURATION                              SAVE
TESTS                                      DIAGNOSTIC
MEMORY                                     SAVE    SCREENS  00  TO  SCREENS  00

  -UP-      -DOWN-      -LEFT-      -RIGHT-     -SELECT-    -PERFORM-    -EXIT-
   F1         F2          F3          F4          F5          F6          F7
```

Figure 4-1. The Configuration Menu

Note

The terminal must be configured to match the data communication format of the host or peripheral equipment. Consult your equipment manual for details on the required format.

Modifying the Configuration

The current configuration is displayed in the Configuration menu. To change the configuration of one of the features or functions, do the following:

1. Move the cursor to the status message which is to be changed by using appropriate function keys [F1-F4].
2. When the cursor is at the desired status message for a particular feature or function, press the [F5] SELECT Key to scroll through the options available.
3. When the desired option is displayed, set the terminal to the new status by simply moving the cursor to another status message.
4. After you have selected the desired option for all the features and functions, you can temporarily save the configuration by pressing the [F7] EXIT key to take the terminal out of Configuration mode. In this case the configuration will be maintained only as long as the Mini OIT is powered up. If you want to save the displayed options as the power-up configuration, see the section, Saving and Recalling the Configuration, below.

An exception to the above procedure is the method used to set the Multi (multidrop address) function:

1. As before, move the cursor to the status message.

2. Press the [F5] SELECT key to change from Point-to-Point to Multi. When Multi is first displayed a dim cursor block appears to the right of the word Multi. In the cursor block is a number (00-15) which indicates the number of drops to be configured.

   If the previous configuration was Multi, press the [F5] SELECT key once to select Point-to-Point or twice if you wish to return to Multi to change the number of drops.

3. Press the [F5] SELECT key to scroll to the desired number of drops or enter the number directly from the keyboard.

4. When the desired number of drops is displayed, press the [F6] PERFORM key to retain the number of drops entered. You can then move to the next field to be configured.

Saving and Recalling the Configuration

Once the configuration is set up, the configuration can be saved for future power-off/power-on cycles. When this is done, the saved configuration will be entered automatically by the terminal on power-up, regardless of the configuration it had when power was shut down.

To **save** a configuration set-up, follow this procedure:

1. Move the cursor to the configuration SAVE/RECALL status message.
2. Press the [F5] SELECT key to display the SAVE message.
3. Press the [F6] PERFORM key to save the displayed configuration.

Note

Any previously saved configuration will be lost when the Save command is executed.

If you have made changes to the configuration, but you want to **recall** the last configuration that was saved, follow this procedure:

1. Move the cursor to the configuration SAVE/RECALL status message.
2. Press the [F5] SELECT key to display the RECALL message.
3. When the RECALL message is displayed, press the [F6] PERFORM key to reset the terminal to the last configuration that was saved.

Exiting the Configuration Menu

To exit the Configuration Menu, press the [F7] EXIT key. The terminal will automatically exit the Configuration menu if the terminal is allowed to remain idle for a period of about 4 minutes. In either case, the terminal will automatically go into the operating mode displayed on the screen.

When the terminal exits the Configuration menu, the screen will be cleared and the cursor (if selected) will be in the upper left corner of the screen (HOME). Any data on the screen prior to entering the Configuration menu will NOT be saved.

Configuration Options

This section contains first a brief summary and then a detailed description of the options available from the Configuration menu.

The table below lists all the Mini OIT functions and the options for each.

Table 4-1. Summary of Configuration Menu Options

FUNCTION	OPTIONS
Mode of Operation	Local, On-Line, Edit
Escape Sequence	ANSI, VT-100, VT-52
Echo / No Echo	Echo, No Echo
Case of Char. Transmitted	Send Any Case, Send Caps. Only
End of Line Characteristics	Wrap, No Wrap
	Auto Line Feed, No Auto Line Feed
Cursor Type	Blinking Block, Blinking Underline
	Steady Block, Steady Underline
	No Cursor
Keyboard Codes (Types)	One, Two, Three, Four, Five
Serial Port Configuration	
Baud Rates	50, 110, 134.5, 150, 200, 300, 600, 1050, 1200, 1800, 2000, 2400, 4800, 9600, 19.2 K, 38.4 K
Parity	Even, Mark, Space, Odd, None
Number of Stop Bits	7 bit, 8 bit
Type of Handshaking	Hard, Soft
Communication Type	Point to Point, Multidrop
Serial / Parallel Port Configurations	Serial is Primary, Parallel is Auxiliary
	Parallel is Primary, Serial is Auxiliary
	Serial and Parallel are Primary
	Easy Display Filter time: 5
	User Programmable Filter time: 5
Configuration Screen	Save, Recall
Confidence Tests	Diagnostic, Communications,
	Display Test Pattern, Extended Memory
	Manufacturing Cycle
Extended Memory	Save Screens 00 to Internal 01
	Recall Internal 01 to Screens 00
	Swap
	Compare
Screen Saver	OFF, ON

The default configuration as shipped from the factory, or in the event of the loss of battery back-up, is as follows:

Table 4-2. Default Configuration for the Mini OIT

Local mode	Keyboard Code THREE
ANSI escape sequences	9600 Baud
Echo Off	Even Parity
Send Any Case	7-Bit Word
Wrap at End of Line Off	1-Stop Bit
Auto Line-feed Off	Hardware Handshaking
Blinking Block cursor	Point-To-Point communications

Mode of Operation

On-Line Mode. The On-Line mode is the normal operating mode after the Mini OIT is installed and ready for normal everyday operations. This is also the mode used for programming a remote device such as the ASCII/BASIC module. The On-Line mode is especially useful for simulating and testing the communication sequences and protocol used with a remote device.

When the unit is on-line, the keyboard, depending upon its layout, can transmit any one of 128 ASCII characteristics serial port to a computer or other intelligent machine. In the On-Line mode, the terminal can be configured for either Echo (half-duplex) or No-Echo (full-duplex) operations. In Echo mode, the character sent will also be displayed on the screen. In the No-Echo mode, the host computer or programmable controller must return the character before it is displayed. However, some of these characters will not be displayed if the computer sends them back to the OIT. ASCII characters 0-31 are non-displayable characters. Most applications will use No-Echo operations.

Edit Mode. The Edit mode is used to access the OptiSCREEN Editor. The OptiSCREEN Editor is used to create screen formats to make the display of data easy to read. The screen format usually consists of the screen title, explanations of the dynamic data sent from the host, and any graphics such as lines and boxes used to clearly present the data.

Local Mode. Local mode can be used for learning the use of various escape sequences and for screen creation (although the OptiSCREEN Editor is normally used to create screens). When the unit is in the Local mode, no characters are transmitted, but are displayed directly on the screen. Cursor controls and escape sequences are processed immediately by the unit.

The ”ASCII Characters” and ”Escape Sequences” listed in the appendices show the commands and special escape sequences that the Mini OIT supports. Your computer-based system must contain the proper software for it to respond to and send the codes that use these special functions. Different versions of software may support different features.

Escape Sequence Type

The Mini OIT is an intelligent terminal. In addition to simply transmitting and receiving data, it can respond to a wide variety of commands, referred to as escape sequences throughout this manual.

Note

Escape sequences are a combination of the ASCII code 1B (hex) / 27(dec), which is the code for the Escape key (Esc), followed by one or more additional characters. Escape sequences are normally sent by the host to the Mini OIT and are used to change screen attributes, move the cursor, store and recall screens, plus many other operations.

The Mini OIT supports numerous commands in the ANSI format, as well as commands previously defined by Digital Equipment Corporation for the VT-52 and VT-100 display terminals. Any of these modes may be used (ANSI, VT-52, or VT-100). Many of the non-standard, private commands used by the DEC VT-100 are also supported by the ANSI mode.

Few terminals use all of the commands defined by ANSI X3.64; many define private commands that expand on the ANSI set. To be ANSI compatible, a device must be able to recognize properly formatted ANSI commands and ignore those standardized commands that are not used. Any private commands (although ANSI compatible) generated by your software must either be supported or safely ignored by the terminal actually being used.

Echo or No-Echo Mode

Allows half-duplex (Echo) or full-duplex (No-Echo) operation. In No-Echo mode, all keys entered are transmitted to the host device and no action is taken by the terminal until the host returns the same key codes. In Echo mode, the keys entered are transmitted to the host and simultaneously action is taken by the terminal as if the key codes had been returned by the host.

Note

A remote device can disable the Echo mode of the terminal by sending the Disable Half-Duplex command (Esc [> 14 l) to the Mini OIT when the Mini OIT is On-Line.

Send Any Case/Send Upper Case Only

If Send Upper Case Only is selected, lower-case characters are automatically transmitted as upper-case characters.

End of Line Controls

The options are: Wrap or No Wrap, Auto Line-Feed or No Auto LF. The Wrap feature causes an automatic carriage return and line feed when a character is displayed in the 80th column. The Auto Line-Feed feature enables the terminal to automatically perform a line-feed when a carriage return is processed. This function should be disabled if double line-feeds appear on the screen since this means that the host is already sending a line feed with each carriage return. The terminal must be in the same configuration when a screen file is being created as it will be when the screen is being used.

Cursor Type

Allows the user to select Blinking Block, Blinking Underline, Steady Block, or Steady Underline cursor. It has no effect on the transfer or processing of data.

Screen Saver

A new option has ben added to the Configuration menu to allow for the enabling of a CRT screen saver function. When enabled the CRT will be turned off after five minutes (Ç ten seconds) of not sensing any screen or keyboard activity. When the OIT either senses a keypress or receives display information it will automatically turn the CRT back on. When the CRT is turned off, the initial keystroke will turn the CRT back on, but the keypress will NOT be acted upon. By default the screen saver option is disabled.

Sealed Keyboard Encoding

This feature describes the type of sealed keyboard that will be attached during normal operation.

Type 1 Keyboard. This option is selected when using the 65-position model with the "Terminal" keyboard insert. The layout is for the non typist.

Type 2 Keyboard. This option is selected when using the 65-position model with the "BASIC Programmer" keyboard insert.

Type 3 Keyboard. Not used.

Type 4 Keyboard. This option is selected when using the 65-position keyboard with the QWERTY-style key layout.

Type 5 Keyboard. This option is a user-programmable keyboard layout that allows you to define the ASCII codes for the keyboard. It is selected when using the programmable Touch Screen keypad for operator input. It is also selected if you wish to customize any of the other sealed keyboard layouts.

Serial Port Configuration

Baud Rate Selection. Allows the following baud rate selections: 300, 600, 1200, 2400, 4800, 9600, 19,200, and 38,400.

Parity Selection. You can select Even, Odd, or None parity. Even, Odd, or None parity can be used with either 7 or 8-bit word lengths. .

Word Length. The word length may be either 7 or 8 bits long.

Number of Stop Bits. You can select 1 or 2 stop bits. If the host or peripheral equipment runs at a baud rate of 110 or lower, 2 stop bits should generally be selected. For higher baud rates, select 1 stop bit. Consult the manuals for the remote host or peripheral equipment for specific requirements.

Type of Handshaking. Allows selection of either software or hardware handshaking. If your equipment does not support either hardware or software handshaking, the terminal should be configured for hardware handshaking. When this configuration is used, you must avoid overflowing the input buffer. Refer to the section on serial port operation in Chapter 3, "Installation", for a description of the handshaking operation.

Communication Type (Point-to-Point or Multidrop). Selects on-line communication mode for the primary port. Point-to-point connection allows either software or hardware handshaking to be used, and will accept RS-232 or RS-422 signals. The multidrop configuration allows a host to communicate with up to 16 terminal addresses, all on the same RS-422 multidrop line. Multidrop mode automatically selects Echo operation. When multidrop mode is selected and software handshaking is not supported by the

host, hardware handshaking should be selected but may not be used (Jumper Pin 5 to Pin 20 on the Mini OIT primary port).

Serial/Parallel Port Configurations

There are 5 different port configurations for On-Line operation.

Serial Port is Primary, Parallel Port is Auxiliary. This is the most common mode of operation for the Mini OIT. This mode is used when connecting the Mini OIT to the ASCII/BASIC module of a Series Six, Series Five, or Series One PLC.

This mode permits operator input (two way communications). The serial port is connected to the host using RS-232 or RS-422 connections. The host transmits characters or escape commands to the Mini OIT. When a sealed membrane keyboard or a full travel keyboard is plugged into the Mini OIT, characters can be transmitted back to the host device. Also, characters can be transmitted from the parallel port, but all characters transmitted to the parallel port will be ignored. A parallel printer can be connected in this configuration.

Parallel Port is Primary, Serial Port is Auxiliary. In this configuration, the Mini OIT is connected through its parallel port to a host with a parallel port. Characters can be transmitted from the serial port, but all characters transmitted to the serial port will be ignored.

Parallel and Serial Port are Primary. In this configuration both the serial port and the parallel ports can receive characters. Any characters entered on a touch screen, membrane keyboard, or full-travel keyboard are simultaneously transmitted out both the serial and parallel ports.

Easy Display. This configuration is specifically designed so that the Mini OIT can be used as an intelligent stored message display with a parallel interface. The parallel port is connected to the host through a parallel cable. This configuration allows a PLC, using only the discrete outputs of a 5 V TTL Output module, to initiate the display of screen files on the screen. In addition to displaying stored screen files, alpha-numeric information, binary, or binary coded decimal (BCD) numbers may also be sent to a printer or any other device that has a parallel input port.

When Easy Display mode is selected on the Configuration screen, a filter time is also displayed. This number represents the number of poll times that the input data must be read without changing before the data is accepted as valid information. This value can be set from 1 to 255 for noise filter times from 1.04 milliseconds to 266 milliseconds.

User Programmable. In this configuration the Mini OIT can be programmed by the user to select the I/O status of all 16 parallel signal lines. Each line can be either turned on or off at the command of the operator or host device. Contact GE Fanuc Automation for further information.

Note

For information on using the parallel port in Easy Display mode, refer to Chapter 3, "Installation".

Save/Recall Configuration Screen Parameters

Allows the current displayed configuration to be saved, or the previously saved configuration to be recalled.

Confidence Tests

The Configuration menu allows you to select a number of tests which will confirm the correct operation of the unit. The menu supports a Diagnostic test, a Communication test, an Extended Memory test, a Manufacturing Cycle test, and Test Pattern displays which allow adjustments to the CRT.

Diagnostic Test. The Diagnostic test causes power-up diagnostics to be performed continuously until failure occurs or until the operator presses any key.

Communication Test. The Communication test checks both the serial and the parallel ports. Before executing this test, a loop-back connector constructed as shown in the figures below must be constructed and installed. This test can be performed at any baud rate, and with either RS-232, RS-422, or parallel signals. In the event of a failure, a failure code is displayed. The terminal should be reset prior to restarting the test.

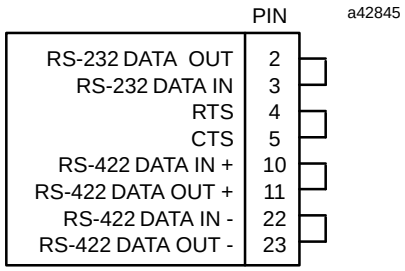


Figure 4-2. Serial Port Loop-Back Diagram

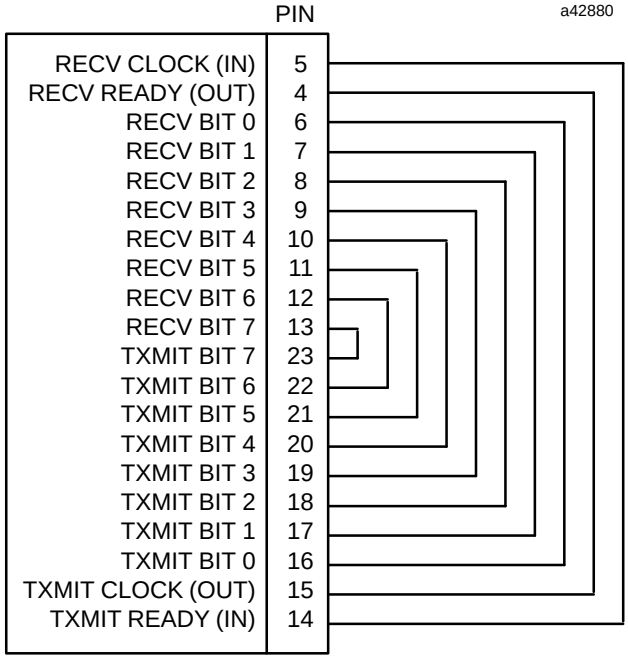


Figure 4-3. Parallel Port Loop-Back Diagram

The following table lists the error messages that may be displayed if the Mini OIT fails the Communication test:

Table 4-3. Communication Test Error Messages

ERROR	PORT (conn.)	FAILURE	TEST DATA
11	Serial (J1)	No data received	55H
12	Serial (J1)	Wrong data received	55H
13	Serial (J1)	No data received	6AH
14	Serial (J1)	Wrong data received	6AH
15	Serial (J1)	CTS did not turn off	
16	Serial (J1)	CTS did not turn on	
21	Parallel (J6)	No data received	FFH
22	Parallel (J6)	Wrong data received	FFH
23	Parallel (J6)	No data received	00H
24	Parallel (J6)	Wrong data received	00H
25	Parallel (J6)	No data received	55H
26	Parallel (J6)	Wrong data received	55H
27	Parallel (J6)	No data received	AAH
28	Parallel (J6)	Wrong data received	AAH

Extended Memory Test. The Extended Memory test checks user memory. Caution should be observed when running this test, since a terminal reset or power interruption during the test could modify the stored user memory.

Manufacturing Cycle Test. The Manufacturing Cycle test causes the terminal to run the Diagnostics test, the Communications test, and the Extended Memory test one after the other.

Display Test Pattern Test. This test displays a changing test pattern which allows you to adjust the CRT to optimum performance.

Extended Memory Operations

The options are Save, Recall, Swap, and Compare. From the Configuration screen, you can save, recall, swap, or compare the contents of one bank from or to the other memory bank.

Note

Because the Save, Swap, Compare, and Recall functions can be performed between memory banks, care must be taken to ensure that screens are not inadvertently lost by performing a Save operation from one bank into the other bank. It is possible to overwrite unique information.

The firmware does not allow memory banks that are not installed to be selected on the Configuration menu. Only those internal banks that exist will be displayed as the Select key is used to cycle the options.

When executing a Back-Up memory operation from the Configuration menu, pressing the Perform key causes a status message to appear next to the Save / Recall / Swap / Compare message area which says "WAIT.." and then

”COMPLETED”. No action should be taken until the message, ”COMPLETED”, appears.

Note

Refer also to Chapter 3, ”Installation”, for information on extended memory installation.

Bank 00 is the default screen storage bank. The default bank will remain selected until the next select default escape sequence is processed or until the Mini OIT is reset or powered off. Bank 00 will always be the initial screen bank after the unit is powered up.

All screen file commands (Create, Append, and Display) process a screen file from the currently selected bank unless a different bank is specified in the command. The bank specified in the command becomes the temporary screen bank. The previous or default screen bank is restored at the end of the command processing.

Screen files which contain commands which display other screen files may specify files in other screen banks. These files may in turn display other files in the same or other banks. This is called File Nesting.

The Set Default Screen File Bank Command must not be used in any screen file. It is a command which is processed when received at the primary port in on-line mode.

On the Mini OIT the memory banks are referred to as ”SCREENS 00” and ”INTERNAL 01”. This allows you to use one bank as the primary bank and one bank as the backup bank.

Valid Screen Files Verification

Whenever the Mini OIT is powered up, the diagnostic test routine is performed (data in Screen Bank 00 is checked to verify that the list of screen files can be correctly scanned). If the screen file list is improperly formatted or has never been initialized, Screen Bank 00 will automatically be initialized.

Screen Bank 01 can be tested by selecting it as the default screen bank. The test is also made before a directory is displayed. The message, ”USE CONTROL-C TO INITIALIZE SCREENS”, will be displayed if the test fails. Pressing [Ctrl]-C will initialize that bank; pressing any other key will terminate the operation being performed. The default screen bank will be reset to Bank 00.

Note

It is especially important that screen memory be initialized before screen creation, display, or directory commands are invoked. Use of these commands prior to initializing screen memory may prevent proper operation of many other commands.

The test is not performed when a screen file is displayed, appended, stored, or transmitted. If a bank is selected as the temporary screen bank by including the bank number in the command, and that bank is not in screen file bank format, results are undefined. One possible error message is MEMORY FULL.

The OptiSCREEN Editor

The OptiSCREEN Editor is a built-in screen development and editing system available on the Mini OIT. It is accessed by selecting the Edit mode from the Configuration menu.

Note

The OptiSCREEN Editor is compatible with the ANSI and VT-100 operating modes only. VT-52 mode is not supported. The OptiSCREEN Editor was designed for use with a full-travel IBM PC-XT compatible QWERTY-style keyboard. It is possible to use the editor with the sealed keyboards, but some functions will not be available.

The menu-driven OptiSCREEN Editor eliminates the need to memorize, or even be familiar with, escape sequences used to create screen files as you do when using Local mode. While in the Edit mode, escape sequences and other non-text information are replaced by simple, English-language OptiSCREEN statements. The same internal storage format for screen files as used in earlier firmware releases has been maintained, therefore, previously created files may be used and edited.

Other OptiSCREEN Editor features are listed below:

- An OptiSCREEN program consists of a series of statement lines. Statements are either command statements, display (text) statements, or comments.
- Screen files can be displayed immediately, exactly as they will be executed.
- File numbers and names can be altered. A copy of a file can be created as a different file number.
- Files can be deleted completely and removed from the directory.

OptiSCREENEditor Menu

The OptiSCREEN Editor menu is entered by selecting Edit from the Configuration menu and pressing the [F7] PERFORM key. If Edit has been selected and saved as the power-up configuration, then upon power up the Configuration menu will first appear and after a few seconds the Edit menu will appear automatically.

The OptiSCREEN Editor menu is shown below:

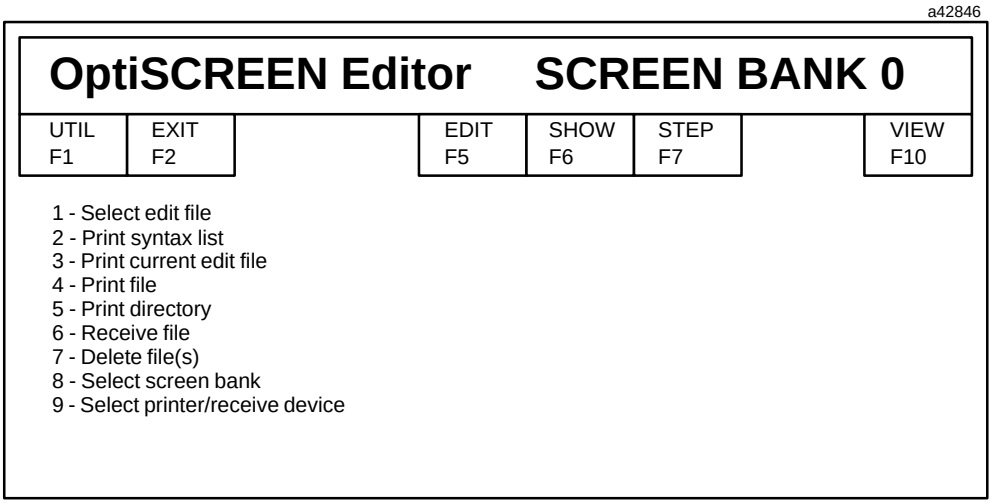


Figure 4-4. The OptiSCREEN Editor Menu

OptiSCREENEditor Menu Operations

The following operations can be executed from the OptiSCREEN Editor menu:

Select Edit File. Allows you to select a screen file to be edited. When you enter the number of the file, the OptiSCREEN program file listing is displayed on the screen with the workstation in Edit mode.

Print Syntax List. Prints a list of the OptiSCREEN command statements that are used to execute a screen file, along with the internal escape sequences they correspond to. For all of the OptiSCREEN Editor menu Print functions, if a listing of a file is desired for reference, the terminal should be configured to send the output to a hardcopy printer (using the Select Printer / Receive Device function of the Editor). A display of what is being printed will briefly be shown on the screen, but will rapidly scroll through the file and then return immediately to the OptiSCREEN Editor menu. If you are viewing the Syntax List on the screen you can press [Ctrl]-s to stop and start the display.

Print Current Edit File. Prints a listing of the current status of the file being edited.

Print File. Allows a screen file to be selected for printing. The screen will display a prompt asking for the file number, and will print the file when the number is entered.

Print Directory. The Directory of Screen Files may be displayed or printed with a single keystroke.

Receive File. Configures the terminal to receive a file being sent to it through one of the communication ports. A prompt is displayed asking for the number of the file to be received; and then a choice of which port it is to be received on. (The Display option listed will have no effect.)

Delete File(s). Files may be deleted completely and removed from the directory. A prompt will be displayed asking for the file number to be deleted.

Select Screen Bank. Allows you to select another screen bank if it exists.

Select Printer/Receive Device. Allows you to select the port through which data will be sent or received. Options are Display Only or Serial Port.

OptiSCREENEditor Special Function Keys

Across the top of the OptiSCREEN Editor menu are six function keys. The purpose of each key is explained below.

Note

Menu selections do not affect the current file being edited except for the Select Edit File and Receive File functions. If you select one of these functions, you have the option of saving the changes made to the current file before the new menu operation is begun. If one of the other menu functions is selected, after it is completed you can return to the original file at the same line from which you left by pressing the Edit key.

[F1]UTIL Key. The [F1]UTIL key will call the OptiSCREEN Editor menu to the screen. Even during a file editing session, the [F1] key may be used to access the functions in the OptiSCREEN Editor Menu.

[F2] EXIT Key. The [F2] EXIT key enables the terminal to leave the OptiSCREEN Edit mode, and provides the option of saving the changes and renumbering the file that was being edited. If the changes are saved but the file is not renumbered, the old version of the file will be replaced by the new version. A renumbered file will be saved under the new number, and the old file will remain in its original state. After a save or renumber operation is completed, the display returns to the main Configuration menu.

[F5] EDIT Key. From the OptiSCREEN Editor menu, the Edit key can be used to initiate an editing session on a screen file. A prompt will be displayed asking for the number of the file to be edited. When the file number is input, the terminal calls up the OptiSCREEN program file in the Edit mode. Editing can be done as described in preceding paragraphs. When one of the other special function keys is in operation (Show or Step, for example), the Edit key is used to return to the Program File Edit mode.

Note

During editing, if another function is selected that conflicts with the current file editing process, the message, "SAVE EDITED CHANGES? (Y or N):", appears. It requires an operator response before the new operation can be performed.

[F6] SHOW Key. You can go from the OptiSCREEN program file being edited to a display of the file as it is executed by pressing the [F6] SHOW key. Pressing the [F5] EDIT key will return the display to the program file being edited at the same location it left.

[F7] STEP Key. In the Program File Edit mode, the program file execution can be viewed one step at a time by pressing the [F7] STEP key. The file will be displayed as executed up to the current cursor location in the OptiSCREEN statement listing. The next steps will be displayed one at a time as executed by pressing the Cursor Down key.

The file can also be backed up by pressing the Cursor Up key; however, each time the cursor is moved from one line to the next, it will be interpreted as an execute order, regardless of the direction the cursor is moved. This may fill the screen with extraneous

graphics. Press the Edit key to return to the program file at the point where the Step process was exited and then the Step procedure can be repeated.

[F10] VIEW Key. Other screen files may be displayed by pressing the [F10] VIEW key and then entering the file number of the other file to be displayed. Once again, when the [F5] EDIT key is pressed, the display will return to the current program file being edited at the same place from which it left.

Note

When displaying a file using the Show, Step, or View functions of the OptiSCREEN Editor, the file will be displayed using the configuration that was saved from the main Configuration screen. Those functions which affect the display of screens (such as Wrap, or Auto LF, etc.) should be saved prior to using the editor.

Entering the File Edit Function

To enter the File Edit function follow the procedure below.

1. Press either the [F5] EDIT key or the Select Edit File operation, number 1, from the OptiSCREEN Editor menu. The message, "Type file number:", will appear.
2. Type in the number of the file you wish to create, or, if you wish to edit an existing file, the number of the file you wish to edit. Then press the Return key.

Once a screen file is selected for edit and the program is displayed, you can perform a variety of operations such as SHOW and STEP and then return immediately to the program of the file being edited by pressing the [F5] EDIT key. If you wish to edit a different file, use the Select Edit File operation.

File Editing Operations

When you enter the Edit function, the screen clears and the cursor type selected (if selected) appears in the upper left corner of the screen. You can now type the various statements described in Chapter 5.

There are a number of editing operations that will help you construct a program for a screen format. These are explained below.

Entering OptiSCREEN Commands The OptiSCREEN Editor does not require commands to be spelled out in their entirety, or even spelled correctly. The OptiSCREEN Editor will match up an entry with the closest actual command When the line is terminated by pressing the [Return] key or moving off the line with a cursor key, the line is evaluated and re-displayed with the actual statement and syntax.

If an invalid abbreviation is used, the programmer will immediately recognize that the operating statement is different from the intended statement and can correct it.

Scrolling the Program When a program for a screen is listed in OptiSCREEN format, each line on the display is a single OptiSCREEN statement. Up to 16 program lines can be displayed at one time. OptiSCREEN programs that exceed 16 lines may be scrolled up or down by a page of 15 lines using the [Page Up] and [Page Down] keys. When the cursor is at the top or bottom of the screen, the [Cursor Up] and [Cursor Down] keys will scroll the program up or down one line at a time. Pressing the [Ctrl] key and the [Page Up] key [Ctrl]-[Page Up] or [Ctrl]-[Page Down] moves the editor to the beginning or end of the file. The [Home] key moves the cursor to the beginning of the current line, while the [End] key moves it to the end of the current line.

Inserting and Deleting Lines Lines may be inserted or deleted. Pressing [Ctrl]-[Insert] will insert a new blank line in the program. Pressing [Ctrl]-[Delete] will delete a line from the program.

Inserting and Deleting Characters Characters on a line may be inserted or deleted. The Editor will initially be in the Replace mode; pressing the [Insert] key places the editor in Insert Character mode. It will return to Replace mode as soon as the cursor is moved to another line.

Program Comments The use of an apostrophe indicates a comment. A comment at the beginning of a file becomes the file name. Comments in the body of the file must be separate line entries; they may not be added at the end of a line.

DISPLAY Statement Text Strings Quotation marks are used to indicate the start and end of a DISPLAY text string. Including quotation marks within a text string can only be achieved by repeating the quotation marks. For example, to display:

```
word "data" word ;  Enter:  DISPLAY  "word ""data"" word".
```

Non-displayable ASCII characters that are included in a DISPLAY text string will be shown as an abbreviation surrounded by braces, e.g. {CR}, {LF}.

Saving, Renumbering, and Renaming a Screen File

To **save** a screen file:

1. Return to the OptiSCREEN Editor screen. If you are displaying a screen file or editing the screen program this is done by pressing [F1] UTIL.
2. There are a number keys you can press to initiate the "Save" operation. If you wish to exit the OptiSCREEN Editor after saving, press the [F2] EXIT key. If you wish to edit a different screen file after saving, press the number 1.
3. After the "Save" operation is initiated, prompts as shown below will appear. SAVE EDITED CHANGES? (Y or N). Press Y to save or N if you do not want to save the file.

To **renumber** a file:

After edits to a screen file have been saved, the following message appears, CHANGE FILE NUMBER? (Y or N). If Y is pressed, the message, TYPE NEW FILE NUMBER, appears. When the new file number has been entered, it flashes COMPLETED and returns to the Configuration screen. The old file remains in the directory in the same form it had before being edited.

To **name** or **rename** a screen file:

The file name is an optional part of the screen file. To name a file, enter the file name as a comment on the first line of the screen file. To rename the file, simply change the name in the first line.

Keyboard Operation

The keyboard is used to send data to your computer (programmable controller, CNC, etc.) when the Mini OIT is in On-Line mode. In Local mode the keyboard sends characters directly to the screen. In Edit mode, the keyboard is used to create screens with the OptiSCREEN Editor.

The sections below describe the capabilities of the IBM PC-XT keyboard and the 65-position sealed keyboards. Not all keys will be found on all keyboards.

Note

The IBM PC-AT type keyboard is not compatible with the Mini OIT.

Alphabetic Keys

If an IBM PC-XT type full-travel keyboard or one of the 65-position sealed keyboards is attached, any of the 26 letters of the alphabet may be entered. An IBM PC-XT compatible keyboard will send either upper or lower-case letters, depending upon the state of the Caps Lock key. The 65-position sealed keyboard will automatically send upper-case letters unless the Shift key is simultaneously depressed, which will cause lower-case letters to be sent. If the terminal has been configured for upper-case only in the Configuration screen, only upper-case letters will be sent regardless of the state of the keyboard.

Non-Alphabetic Keys

Non-alphabetic keys are those with double markings. These include the numbers 0 through 9, punctuation marks, and special characters. The lower marking is generated when the Shift key is not depressed, while the upper marking is generated when the Shift key is depressed.

Cursor Keys

The cursor and home keys transmit an escape sequence corresponding to their particular function when they are pressed. The actual escape sequence will follow the ANSI standard, VT-100, or VT-52 emulation, depending upon which mode the terminal is

using. For example, in the ANSI mode, Cursor Up sends {Esc} [A, Cursor Home sends {Esc} [H.

As with all other keys, the terminal will not perform the function associated with the keys in On-Line mode unless the host device echoes the data back, or the terminal has been configured for Echo operation.

When the terminal is being used with other hosts that execute some form of BASIC, the escape sequences sent by cursor keys can be difficult to use. In this case the command, {Esc} [> 15 h, can be sent to the terminal to totally disable the cursor keys so that they do not transmit any codes.

Function Keys

Depending upon the keyboard, up to 10 separate function keys may be labeled. On certain keyboards, fewer function keys may be shown: but with the use of the [Shift] and [Control] keys, a total of 16 function keys may be accessible. The function keys are designed to generate a sequence of key strokes that can be used either by the terminal or a remote host to perform unique operations that could not otherwise be performed by a single ASCII code.

In the Local mode, the function keys generate pre-defined escape sequences that select or change screen and character attributes.

In the On-Line mode, the function keys will transmit or generate a user programmed sequence of one to sixteen characters. After initialization of screen memory, the function keys will have a default set of characters stored. The default definitions are ANSI escape sequences that can be used by a remote host to recognize each key. [F1] through [F4] correspond to the PF1 through PF4 keys on the DEC VT-100 terminal.

In the Edit mode, the function keys perform special pre-defined OptiSCREEN Editor operations.

Miscellaneous Keys

The characteristics in the following descriptions apply only to the internal handling of the listed functions. In No-Echo operation, functions such as Return, Line Feed, Space, Back Space, and Delete, are transmitted to the host and will be acted on by the Mini OIT only if the host retransmits the same functions back.

[Return] - Moves the cursor to the first character position of the line it is currently in. If the cursor is already at the first character position, it remains there. Return may generate a line feed if Auto LF on CR has been selected.

[Line Feed] - Moves the cursor down one line. If the cursor is at the bottom line, Line Feed causes it to remain there, but all of the data on the screen moves up one line. Data on the top line is lost as it is shifted up and off the screen. **[**Line Feed] may generate a return if Auto CR on LF has been selected.

[Space] - Moves the cursor one character position to the right. If the cursor was positioned on a displayed character, it will be replaced by a space. When a space occurs at the end of the line, the cursor will remain there unless Wrap at End of Line mode has been selected.

[Back Space] - Moves the cursor one space to the left. If the cursor is at the left end of

the line, the cursor will not move. Many forms of software use this key to delete the last input character.

[Delete] - Transmits the ASCII code 7F (Hex). It is a non-displayable character. The host computer software may use this to generate its own functions.

[Repeat] - When this key is depressed, any other key depressed will be repeatedly transmitted at the lesser of 15 characters per second or the baud rate. On IBM PC compatible keyboards and keyboards used with the Mini OIT, all keys are designed to start repeating after being depressed for approximately 1/2 second.

[Esc] (Escape) - A non-displayable character that transmits the ASCII code 1B (hex)/27 (decimal). This key is Escape used in combination with other keys to enter terminal commands. These commands are used to change screen attributes, move the cursor, store and recall screens, plus many other operations.

[Break] - When this key is depressed and enabled as the Break key, a continuous space level output is generated on the primary port. It is generally used to tell a host computer that you wish to interrupt execution.

[Reset] - When the [Reset] key and the [Shift] key are pressed at the same time, the Mini OIT is reset to its power-up condition and the display is cleared.

Control Keys

The Control [Ctrl] key is held down in conjunction with other keys to send the 32 ASCII control codes (0-31). These are non-displayable characters. The Mini OIT responds to only nine control characters. They are:

Bell (BEL or [Ctrl]-G) - Not used with the Mini OIT.

Back Space (BS or [Ctrl]-H) - Duplicates the [Back Space] key.

Tab (HT or [Ctrl]-I) - Software controlled to move the cursor to the next tab stop (8 character spaces) to the right. The tab stops are fixed at columns 9, 17, 25, 33, 41, 49, 57, 65, and 73. If the cursor is in columns 73 through 79, each time [TAB] is received, the cursor will only move one character position to the right. If the cursor is at column 80, it will not move.

Line Feed (LF or [Ctrl]-J) - Duplicates the [Line Feed] key.

Carriage Return (CR or [Ctrl]-M) - Duplicates the [Return] key.

Shift In ([Ctrl]-O) - Exits supplemental graphics for current character set (alternate mode to using corresponding escape sequence, VT-100 compatible).

Shift Out ([Ctrl]-N) - Enters supplemental graphics for current character set (alternate mode to using corresponding escape sequence, VT-100 compatible).

Cancel ([Ctrl]-X) - Cancels the current escape sequence.

Escape (Esc or [Ctrl]-[) - Duplicates the [Esc] key.

Private Control Keys

[Ctrl]-1 - When entered from the keyboard, [Ctrl]-1 causes the terminal to go to the Configuration screen.

[Ctrl]-2 - Loads user memory with data from the STR-LINK III.

[Ctrl]-3 - Saves user memory using the STR-LINK III.

[Ctrl]-4 - Compares user memory with data from the STR-LINK III digital cartridge controller.

Chapter 5 OptiSCREEN Command Reference

This chapter explains how each OptiSCREEN command works, and many examples are included. At the end of the chapter is a summary of the commands.

The OptiSCREEN editor converts each of the commands to its corresponding internally-stored escape code. The OptiSCREEN editor was developed to make screen file programming easier, faster, and more efficient.

OptiSCREENCommand Types

The Mini OIT has ten major types of OptiSCREEN commands. These types are briefly described below.

Comment and End of File

The comment sets off text as documentation for the screen file. Any comment found on the first line of an OptiSCREEN file also appears when you display the directory. Comments also identify the purpose of commands and sections of files for yourself and other users. The OptiSCREEN editor automatically inserts the END command at the end of each OptiSCREEN file.

Cursor

These commands control the appearance and location of the cursor on the screen. During operation, the location of the cursor determines the starting position for text and graphics on the screen. Examples of cursor commands include NO CURSOR and the MOVE TO command.

Character Attribute

These change the video attributes of all characters displayed after the command. Examples of character attribute commands include BLINK, SUPPLEMENTAL, QUAD, DIM, and / BRIGHT.

Line Attribute

These set the video attributes for a single line of text on the screen. Examples of line attribute commands include DOUBLE SIZE TOP LINE / DOUBLE SIZE BOTTOM LINE and DOUBLE WIDE LINE.

Display

The DISPLAY command is one of the most commonly used commands in the OptiSCREEN editor. You can generate text and graphics for your application with the DISPLAY command.

File Display

The file display commands display other screen files, allowing you to ”call” other OptiSCREEN files. An example of the file display command is DISPLAY FILE FROM BANK.

Erasing and Editing

The erasing and editing commands allow you to perform a number of operations that edit text and graphics which already appear on the screen: clear the screen or a portion of the screen, insert new text, or specify a scrolling region for text or graphics. Examples of erasing and editing commands include CLEAR SCREEN, DELETE LINE, and SCROLL.

Graphics

The graphics commands draw boxes, change the video attributes for boxed regions of the screen, and draw bar graphs. Examples of graphic commands include BOX, EMPTY BOX, BOX ATTRIBUTES, and HORIZONTAL BAR GRAPH.

Programmable Keyboard, Touch Screen, and Function Key

These commands allow you to set and use the programmable keyboard, touch screen and function key capabilities of a Mini OIT. Examples of these commands include CLEAR KEY TABLE, DISPLAY KEY TABLE, MAKE TOUCH BOX and LOAD KEY. The LOAD FUNCTION KEY command loads the available function keys for a Mini OIT.

User Programmable I/O Mode Commands

These commands are used to control the parallel port in User Programmable I/O mode.

Data Fill Operations

You may create an OptiSCREEN file with numerous blanks left for the host to fill with data. The file creation and appending procedures allow you to create the screen file using the [Ctrl]-E (ENQ, enquiry) control character for the locations on the screen where the system displays data.

Conventions for the OptiSCREEN Commands

This summary lists and describes all of the commands used in the OptiSCREEN editor. All OptiSCREEN command listings follow the format shown below:

COMMAND FORM {ESC}xxx

A short description of the command follows the headline command form. Elements that appear in UPPERCASE LETTERS of the command form are required elements of the command. Elements that appear in lowercase letters are parameters that you supply. A summary of acceptable parameters appears in the description.

Example: A short explanation appears before the example of the command.

```
OPTISCREEN COMMAND 1
OPTISCREEN COMMAND 2
•••
OPTISCREEN COMMAND n
```

Each of the OptiSCREEN commands appear under the heading in which the command is summarized above. An alphabetic summary of the individual commands appears at the end of the chapter.

The Comment Command and the End of File Command

The comment command and the end of file command are two important commands for the OptiSCREEN system.

'comment

OptiSCREEN treats all text following an apostrophe (') as a comment.

comment specifies that the rest of the line is a comment. You can only place the comment at the beginning of the line.

When you make the first line of an OptiSCREEN file a comment, the first 25 characters of the comment line also appear when you generate a directory of OptiSCREEN files.

Example: Give a comment that you might want to place as the first line of an OptiSCREEN file. When you generate a directory of OptiSCREEN files, the system labels this file as Fluid Level, Tanks 1,2,3:

```
'Fluid Level, Tanks 1,2,3
```

END {EOT}

The END command indicates the end of the OptiSCREEN screen file. The OptiSCREEN editor automatically adds the END command to each file that you create.

Cursor Commands

The cursor commands control the appearance of the cursor and specify the location for the cursor on the screen. During operation, the location of the cursor determines the starting position for text and graphics on the screen.

Controlling the Appearance of the Cursor

The following commands determine whether or not the cursor appears on the screen, the appearance of the cursor, and the blinking or non-blinking characteristics of the cursor.

CURSOR or ENABLE CURSOR {ESC}[>5l
NO CURSOR or DISABLE CURSOR {ESC}[>5h

The CURSOR and ENABLE CURSOR commands make the cursor visible so that it appears on the screen. The two commands are identical.

The NO CURSOR and DISABLE CURSOR commands disable the cursor so that it does not appear on the screen. The two commands are identical.

BLOCK CURSOR {ESC}[>4h
UNDERLINE CURSOR {ESC}[>4l

The BLOCK CURSOR command makes the cursor appear as a solid block on the screen.

The UNDERLINE CURSOR command makes the cursor appear as an underline character on the screen.

BLINKING CURSOR {ESC}[>11l
STEADY CURSOR {ESC}[>11h

The BLINKING CURSOR command makes a block or underline cursor blink as it appears on the screen. To make a block of text blink, use the BLINK command.

The STEADY CURSOR command makes a block or underline cursor non-blinking as it appears on the screen.

Controlling the Location of the Cursor

The following commands determine the location of the cursor on the screen.

HOME {ESC}[H or {ESC}[f

The HOME cursor command moves the cursor to the home position at row 1 and column 1.

Example: The underlined number 1 appears in the home position below.

```
12345678911111111112222222222333333333344444444445555555555666666666677777777778
2    01234567890123456789012345678901234567890123456789012345678901234567890
3
4                    < < < Columns 1 through 80 > > >
5
6
7
8   ^
9   ^
10  ^                                        _ MOVE TO 10, 40
11  Rows
12  1
13  through                                                    _ UP 2
14  16
15  ^                                         _ DOWN 5       _ RIGHT 15
16  ^
```

MOVE TO rr, {ESC}[rrr f
MOVE TO rr, cc {ESC}[rrr;ccc f or {ESC}[rrr;ccc H

This command positions the cursor on the screen at a specified row and column position.

rr - specifies row 1 to 16, inclusive. If you specify a row that does not exist, the cursor remains in the current row.

cc - specifies column 1 to 80, inclusive. If you do not specify a column, the cursor moves to row rr and column 1. If you specify a column that does not exist, the cursor moves to column 80.

Example 1: Move the cursor to row 10 and column 40.

```
MOVE TO 10, 40
```

Example 2: Both of the following commands move the cursor to row 15 and column 1.

```
MOVE TO 15,          MOVE TO 15, 1
```

DOWN {ESC}[B
DOWN nn {ESC}[nnn B

This command moves the cursor down the screen.

nn - specifies the number of rows to move. If you do not specify the number of rows, this command moves the cursor down one row.

A screen always contains 16 rows. If the cursor is in row 16, it remains there.

Example: Move the cursor down 5 lines.

```
DOWN 5
```

UP {ESC}[A
UP nn {ESC}[nnn A

This command moves the cursor up the screen.

nn - specifies the number of rows to move. If you do not specify the number of rows, this command moves the cursor up one row.

A screen always contains 16 rows. If the cursor is in row 1, it remains there.

Example: Move the cursor up four rows.

```
UP 4
```

LEFT {ESC}[D
LEFT nn {ESC}[nnn D

This command moves the cursor to the left.

nn - specifies the number of columns, or character cells, to move. If you do not specify the number of columns, this command moves the cursor left one column.

A screen always contains 80 columns. If the cursor is in column 1, it remains there.

Example: Move the cursor left seven spaces.

```
LEFT 7
```

RIGHT {ESC}[C
RIGHT nn {ESC}[nnn C

This command moves the cursor to the right.

nn - specifies the number of columns, or character cells, to move. If you do not specify the number of columns, it moves the cursor one column to the right.

A screen always contains 80 columns. If the cursor is in column 80, it remains there.

Example: Move the cursor right six spaces.

```
RIGHT 6
```

INDEX {ESC}D

This command invokes the line feed to move the cursor down one row. If the cursor is on the bottom row, it remains there.

REVERSE INDEX {ESC}M

This command reverses the line feed to move the cursor up one row. If the cursor is on the top row, it remains there and scrolls text on the screen down one line.

NEW LINE {ESC}E

This command moves the cursor down one row and automatically moves to the beginning of the new line.

LINE rr {ESC}[rrr f or {ESC}[rrr H

This command moves the cursor to the beginning of specified line 1 to 16, inclusive.

rr - specifies the line, or row, number.

A screen always displays 16 rows.

Example: Move the cursor to row 4, column 1.

```
LINE 4
```

SAVE POSITION {ESC}7 or {ESC}[s
RESTORE POSITION {ESC}8 or {ESC}[u

The SAVE POSITION command stores the current location of the cursor so that you can return to that location. The RESTORE POSITION command returns the cursor to the stored location.

Example: Display an OptiSCREEN file. After the system displays the file, store the position of the cursor, display two other files, and then return to the stored position that you specified earlier.

```
DISPLAY FILE 10
SAVE POSITION
DISPLAY FILE 21
DISPLAY FILE 22
RESTORE POSITION
```

Character Attribute Commands

Character attribute commands change the video attributes of all characters displayed after the command.

BLINK {ESC}[5m
EXIT DOUBLE WIDE AND BLINK {ESC}[22m

The BLINK command establishes blinking as the current character attribute mode. After you issue the BLINK command, all subsequent text and graphics slowly flash off and on. (To make the cursor blink, use the BLINKING CURSOR command.)

The EXIT DOUBLE WIDE AND BLINK character attribute command resets the double wide and blink character attributes to normal. This command does not change the foreground or background intensity. The RESET ATTRIBUTES command resets the blink condition as well as all character attributes to the default: normal size, normal color or intensity, no underlining, and no reversed intensities.

Example: Create a single line text message with only the word Warning blinking.

```
MOVE TO 5, 15
BLINK
DISPLAY "WARNING "
EXIT DOUBLE WIDE AND BLINK
DISPLAY " OVEN TEMPERATURE HIGH!"
```

REVERSED {ESC}[7m

The REVERSED command establishes reverse video as the current character attribute mode; normally the characters appear as a light character on a dark background. The background intensity level (bright, dim, or normal) appears the same as the previously specified foreground.

The RESET ATTRIBUTES command resets the reversed attribute as well as all character attributes to the default: normal size, normal intensity, no blink, and no underlining.

Example: Display a two line message. Make the second line use reversed characters to highlight it.

```
MOVE TO 5, 28
DISPLAY "Crusher not moving"
REVERSED
MOVE TO 7, 20
DISPLAY "Check with operator for information"
RESET ATTRIBUTES
```

SUPPLEMENTAL {ESC}[11m or {SO}
EXIT SUPPLEMENTAL {ESC}[10m or {SI}

The SUPPLEMENTAL command establishes the supplemental character set as the current character attribute mode. The supplemental character set consists of the numbers from 0 to 9, the uppercase letters from A to Z, most punctuation marks, and 33 supplemental graphics characters. You specify the supplemental graphics with lowercase letters from a to z and special symbols. A summary and comparison of the standard, supplemental, quad, and double wide characters appears at the end of the discussion of these characters.

The EXIT SUPPLEMENTAL command exits the supplemental character set. This command does not change any other character or line attribute settings.

Example: Display a small box generated with supplemental characters.

```
MOVE TO 5, 20
SUPPLEMENTAL
DISPLAY ”lk”
MOVE TO 6, 20
DISPLAY ”mj”
EXIT SUPPLEMENTAL
```

QUAD SIZE {ESC}[16m
EXIT QUAD {ESC}[17m

The QUAD SIZE command establishes quad size characters as the current character attribute mode. All characters cover the positions from the cursor to the right four character cells and up four lines.

The quad size character set includes the capital letters A through Z, the numerals 0 through 9, and the comma (,), the period (.), the asterisk (*), the plus sign (+), the minus sign (-), the equals sign (=), the slash (/), and the question mark (?). A summary and comparison of the standard, supplemental, quad, and double wide characters appears at the end of the discussion of these characters.

Quad size characters in column 78, 79, and 80 wrap to the next available row (four rows below the current row) and scroll, if necessary, after you specify WRAP AT END OF LINE. This allows you to use the Mini OIT as a quad size message display. After you specify quad size characters, text information sent to the Mini OIT in online mode is correctly displayed and scrolled even when the message exceeds a line or the screen size.

The EXIT QUAD command exits the quad size character set. This command does not change any other character or line attribute settings.

Example: Display a message in quad-sized letters and then exit the QUAD character attribute mode.

```
MOVE TO 5, 10
QUAD SIZE
DISPLAY ”IN PROGRESS”
EXIT QUAD
```

ALTERNATE {ESC}[12m
EXIT ALTERNATE {ESC}[13m

The ALTERNATE command establishes the alternate character set as the current character attribute mode. The alternate character set consists of 128 graphics characters. You specify the alternate character set with the numbers from 0 to 9, the uppercase letters from A to Z, the lower case letters from a to z, and the special symbols.

The supplemental alternate character set gives you a number of additional special graphic symbols. A summary and comparison of the standard, supplemental, alternate, and quad character sets appears at the end of the discussion of these characters.

The EXIT ALTERNATE command exits the alternate character set.

Example: Display two characters from the standard character set and then display a graphic symbol (an ascending diagonal line) from the alternate character set.

```
LINE 10
DISPLAY “lm”
ALTERNATE
DISPLAY “lm”
UP
DISPLAY “lm”
EXIT ALTERNATE
```

DOUBLE WIDE {ESC}[15m
EXIT DOUBLE WIDE AND BLINK {ESC}[22m

The DOUBLE WIDE command establishes double wide characters as the current character attribute mode. The cursor automatically increments two positions for both characters and spaces, but only increments one position for the backspace character. Cursor movements are still performed one position at a time although the position after the double wide character does not appear. Double wide characters in column 80 wrap to the next row and scroll, if necessary, after you specify WRAP AT END OF LINE. A summary and comparison of the standard, supplemental, quad, and double wide character set appears at the end of the discussion of these characters.

The EXIT DOUBLE WIDE AND BLINK command resets the double wide and blink character attributes to normal. The RESET ATTRIBUTES command does NOT reset the DOUBLE WIDE command to normal.

Example: Display double wide text and then return to the normal character attribute mode.

```
DOUBLE WIDE
MOVE TO 5, 10
DISPLAY ”New Instructions”
MOVE TO 7, 20
EXIT DOUBLE WIDE AND BLINK
DISPLAY ”For Loading”
```

Comparison of Various Character Attribute Modes

The following chart shows the similarities and the differences between the ASCII codes and the standard, supplemental, and quad size character modes. (Drawings of the graphics characters appear in Appendix B.) To use the chart, determine the ASCII code for the character that you want to print, find the column that holds the number, and look down the column to see the various outputs available for the character in the different modes.

For example, the letter a is ASCII number 97. In standard character mode, it produces the lower letter a, but in supplemental character mode, it produces a ”checker board” pattern.

The caret (^) is ASCII number 94. In standard character mode, it produces a caret, but in supplemental character mode, it produces a a vertical bar.

Table 5-1. Character/Graphics Modes and ASCII Codes

Character	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII
Standard	0 to 9	A to Z	a to z	space ! ” # $ % & ’ ( ) * + , – . /	: ; <=> ? @	[\ ] ^ _ ‘	{ | } ~
Supple–mental Standard	0 to 9	A to Z	graphics	space ! ” # $ % & ’ ( ) * + , – . /	: ; <=> ? @	[\ ] and graphics	graphics
Quad Size	0 to 9	A to Z	blank	space ! * + , – . /	= ?	blank	blank
Alternate	graphics	graphics	graphics	graphics	graphics	graphics	blank
Supple–mental Alternate	same graphics	same graphics	different graphics	same graphics	same graphics	different graphics	blank

ASCII codes are decimal representations. Drawings of the graphics characters appear in Appendix B.

RESET ATTRIBUTES {ESC}[m or {ESC}[0m

The RESET ATTRIBUTES command resets all character attributes to the default: normal size, normal intensity, no blink, no underlining, and no reversed intensities. The RESET ATTRIBUTES command does not change the character set from supplemental, or quad; nor does it affect line attributes.

BRIGHT {ESC}[33m
/BRIGHT {ESC}[43m

The BRIGHT command sets the foreground intensity level to higher than normal. /BRIGHT sets the background intensity level to higher than normal.

Example: Display information with normal text and the warning in bright text.

```
NORMAL
MOVE TO 5, 1
DISPLAY ”Bin 1 OK”
BRIGHT
MOVE TO 7, 1
DISPLAY ”CHECK BIN 2”
NORMAL
MOVE TO 9, 1
DISPLAY ”Bin 3 OK”
```

DIM {ESC}[31m
/DIM {ESC}[41m

The DIM command sets the foreground intensity level lower than normal. /DIM sets the background intensity level to lower than normal.

Example: Display dim text over a dark background and bright text over a dim background.

```
MOVE TO 5, 10
DIM
/DARK
DISPLAY ”Staging area ”
BRIGHT
/DIM
DISPLAY ”Overloaded”
RESET ATTRIBUTES
```

DARK {ESC}[30m
/DARK {ESC}[40m

The DARK command sets the foreground intensity level to dark. /DARK sets the background intensity level to dark.

NORMAL {ESC}[32m
/NORMAL {ESC}[42m

The NORMAL command sets the foreground intensity level to normal. /NORMAL sets the background intensity level to normal.

Example: Display normal text, bright text, and return to normal again.

```
NORMAL
MOVE TO 5, 20
DISPLAY ”Step 1 Complete”
BRIGHT
MOVE TO 7, 20
DISPLAY ”Step 2 In Process”
NORMAL
MOVE TO 9, 20
DISPLAY ”Step 3 Scheduled, Not Done”
```

UNDERLINE {ESC}[36m
BRIGHT UNDERLINE {ESC}[>37rDIM UNDERLINE {ESC}[35m

The UNDERLINE command sets the foreground intensity level to normal and underlines the text. The BRIGHT UNDERLINE command sets the foreground intensity level higher than normal and underlines the text. The DIM UNDERLINE command sets the foreground intensity level lower than normal and underlines the text.

The RESET ATTRIBUTES command resets all underlining modes as well as all character attributes to the default: normal size, normal intensity, no blink, and no reversed intensities.

Example 1: Display a line of underlined text.

```
UNDERLINE
DISPLAY ”Bin Full”
RESET ATTRIBUTES
```

Example 2: Display a message with one word underlined with a bright underline.

```
BRIGHT
DISPLAY ”System 1 loading ”
BRIGHT UNDERLINE
DISPLAY ”NOW”
RESET ATTRIBUTES
```

ATTRIBUTES: nn, nn {ESC} nnn; nnn m

The ATTRIBUTES command establishes two character attributes as the current character attribute mode or modes.

nn specifies a character attribute mode number from the table given below.

Each OptiSCREEN character attribute command offers an identical ATTRIBUTE command; for example, the ATTRIBUTE: 15 command and the DOUBLE WIDE command are identical. The ATTRIBUTE mode numbers and their paired character attribute commands are listed below:

Mode	Character Attribute Command
0	RESET ATTRIBUTES
1	BRIGHT
2	DIM
4	UNDERLINE
5	BLINK
7	REVERSE
10	EXIT SUPPLEMENTAL
11	SUPPLEMENTAL
14	BRIGHT and / DIM (sometimes called "shade")
15	DOUBLE WIDE
16	QUAD SIZE
17	EXIT QUAD SIZE
22	EXIT DOUBLE WIDE AND BLINK
30	DARK
31	DIM
32	NORMAL
33	BRIGHT
34	DARK
35	DIM UNDERLINE
36	UNDERLINE
37	BRIGHT UNDERLINE
40	/ DARK
41	/ DIM
42	/ NORMAL
43	/ BRIGHT
44	/ DARK
45	/ DIM
46	/ NORMAL
47	/ BRIGHT

Example: Display bright characters on a dim background.

```
ATTRIBUTES:  33, 41
DISPLAY "This is bright underline foreground on normal background"
```

Line Attribute Commands

Line attribute commands set the video attributes for a single line of text on the screen.

DOUBLE SIZE TOP LINE {ESC}#3
DOUBLE SIZE BOTTOM LINE {ESC}#4

These two commands are normally used together to establish double size as the current line attribute mode. Double size characters extend from the current cursor position up one line so that each double size character appears two character cells tall and one character cell wide. Since these commands are line attribute commands, only double size characters can appear on the lines specified.

The RESET LINE ATTRIBUTES command resets the DOUBLE SIZE TOP/BOTTOM attribute as well as all line attributes to single height and single width characters.

Example: Display a single line of double-sized text.

```
MOVE TO 4, 20
DOUBLE SIZE TOP LINE
DISPLAY "ALPHA CORP."
MOVE TO 5, 20
DOUBLE SIZE BOTTOM LINE
DISPLAY "ALPHA CORP."
MOVE TO 9, 20
DOUBLE SIZE TOP LINE
DISPLAY "Distribution System"
MOVE TO 10, 20
DOUBLE SIZE BOTTOM LINE
DISPLAY "Distribution System"
```

DOUBLE WIDE LINE {ESC}#6

This command establishes double-wide characters for an entire line of characters on the screen.

Example: Display a single line of double-wide text and a line of normal text.

```
MOVE TO 5, 20
DOUBLE WIDE LINE
DISPLAY "Sprayer Operating"
MOVE TO 10, 26
DISPLAY "Do not change setting"
```

SINGLE SIZE LINE {ESC}#5

This command establishes an entire line of single-sized characters on the screen. An example of this command appears below under the RESET LINE ATTRIBUTES command.

RESET LINE ATTRIBUTES {ESC}#0

This command resets all line attributes to the default operating mode with single height and single width characters.

Example: Display the words INPUT and OUTPUT with double wide characters. After each of the words, display location n with normal characters. Use the SINGLE SIZE LINE command to reset the first occurrence of double wide characters; use the RESET LINE ATTRIBUTES command to reset the second occurrence.

```
MOVE TO 5, 5
DOUBLE WIDE LINE
DISPLAY "INPUT "
```

```
SINGLE SIZE LINE
DISPLAY ”location 1”
DOUBLE WIDE LINE
DISPLAY ” OUTPUT ”
RESET LINE ATTRIBUTES
DISPLAY ”location 2”
```

Display and File Display Commands

The display and file display commands are two of the most commonly used commands in the OptiSCREEN editor. With the DISPLAY command, you can generate text and graphics for your application. With the DISPLAY FILE command, you can ”call” (or display) other OptiSCREEN files, file memory, or a directory of files.

“text” text
DISPLAY ”text” text

These commands display a string of text that you specify.

text - represents the string that you want to display.

Text strings surrounded by quotes operate the same as the DISPLAY ”text” command.

Example 1: Display a three word message.

```
”Message for Viewing”
```

Example 2: Display a five word message.

```
DISPLAY ”This is a text message”
```

DISPLAY FILE nn {ESC}[> nnn w
DISPLAY FILE nn FROM BANK pp {ESC}[> nnn; ppp w

This command displays another screen file.

nn - specifies the number of the file that you want to display.

pp - specifies the number of the bank in which the file resides.

Example 1: Display the results of the command sequence stored in file 30.

```
DISPLAY FILE 30
```

Example 2: Display the results of the command sequence stored in file 5, bank 01.

```
DISPLAY FILE 5 FROM BANK 01
```

Erasing and Editing Commands

The erasing and editing commands allow you to perform a number of operations that edit text and graphics which already appear on the screen: clear the screen or a portion of the screen, insert new text, or specify a scrolling region for text or graphics.

Clearing the Screen

With the following commands, you can clear the whole screen or a portion of the screen, clear a line or a part of a line, or clear individual characters.

CLEAR SCREEN {ESC}[2J

This command moves the cursor to the home position at row 1 and column 1, clears the entire screen, and resets all attributes to normal. Examples of this command appear throughout this summary.

CLEAR SCREEN FROM CURSOR {ESC}[0J

This command clears the screen from the current cursor position to the end of the screen.

Example: Generate two lines of text, move to the middle of the first line, and delete the screen below and to the right of the cursor. The result is a line that reads "Part".

```
MOVE TO 5, 20
DISPLAY "Part one"
MOVE TO 6, 20
DISPLAY "Second section"
MOVE TO 5, 24
CLEAR SCREEN FROM CURSOR
```

CLEAR SCREEN TO CURSOR {ESC}[1J

This command clears the screen from the home position (at row 1 and column 1) to the current cursor position.

Example: Generate two lines of text, move to the middle of the second line, and delete the screen above and to the left of the cursor. The result is a line that reads "two" only.

```
MOVE TO 5, 20
DISPLAY "First part"
MOVE TO 6, 20
DISPLAY "Part two"
MOVE TO 6, 24
CLEAR SCREEN TO CURSOR
```

CLEAR LINE {ESC}[2K

This command clears the contents of the entire line on which the cursor rests. This command erases the cursor although the cursor does not move.

Example: Generate a line of text, move to the middle of the line, and delete the entire line.

```
MOVE TO 5, 20
DISPLAY "First line"
MOVE TO 5, 25
CLEAR LINE
```

CLEAR LINE FROM CURSOR {ESC}[0K

This command clears the contents of the line from the current cursor position, including the character on which the cursor rests, to the end of the line. The cursor does not move.

Example: Generate a line of text, move to the middle of the line, and delete the line to the right of the cursor. The result is a line that reads "Second" only.

```
MOVE TO 5, 20
DISPLAY "Second line"
```

```
MOVE TO 5, 26
CLEAR LINE FROM CURSOR
```

CLEAR LINE TO CURSOR {ESC}[1K

This command clears the line from the beginning of the line to the current position of the cursor including the character on which the cursor rests. The cursor does not move.

Example: Generate a line of text, move to the middle of the line, and delete the line to the left of the cursor. The result is a line that reads ”test” only.

```
MOVE TO 5, 20
DISPLAY ”Third test”
MOVE TO 5, 25
CLEAR LINE TO CURSOR
```

DELETE LINE {ESC}[M

This command deletes the entire line on which the cursor rests.

The cursor moves to the line following the deleted line. The DELETE LINE command scrolls the existing text below the deleted line up the screen and adds a blank line at the bottom of the screen.

Example: Generate five lines of text, then remove the first line of text and the last two lines of text leaving lines two and three displayed.

```
MOVE TO 5, 1
DISPLAY ”Line One”
NEW LINE
DISPLAY ”Line Two”
NEW LINE
DISPLAY ”Line Three”
NEW LINE
DISPLAY ”Line Four”
NEW LINE
DISPLAY ”Line Five”
MOVE TO 5, 5
DELETE LINE
DOWN 2
DELETE LINE
DELETE LINE
```

DELETE CHARACTER {ESC}[P

This command deletes the character that the cursor covers.

Any characters to the right of the deleted character shift left and the cursor covers the character after the last deleted character.

Example: Enter a line of text, move to the middle of the line, and delete a single character and the space following the character. The result is a line that reads ”Test character”.

```
MOVE TO 5, 20
DISPLAY ”Test 1 character”
MOVE TO 5, 25
DELETE CHARACTER
DELETE CHARACTER
```

Inserting Text

The following commands allow you to insert text or graphics into already existing text or graphics.

INSERT LINE {ESC}[L

This command inserts a single line at the line on which the cursor rests.

After the insertion, the cursor rests on the single inserted lines. The INSERT command scrolls the existing text toward the bottom of the screen.

Example: Insert a single line and add text into the middle of several other lines of text.

```
MOVE TO 5, 1
DISPLAY "Line one"
NEW LINE
DISPLAY "Line two"
NEW LINE
DISPLAY "Line three"
NEW LINE
DISPLAY "Line four"
NEW LINE
DISPLAY "Line five"
MOVE TO 7, 1
INSERT LINE
DISPLAY "Insert text"
```

SCROLL LINES nn TO pp {ESC}[nnn; ppp r

The SCROLL LINES command causes a specified area of the screen to scroll up.

nn - specifies the top line of the scrolling area.

pp - specifies the bottom line of the scrolling area.

After you specify text or graphics to appear on the scrolling lines, the text or graphics shift up one row at a time. Screen data outside of the scrolling lines does not move or change, nor does the cursor position change as the text or graphics scroll through the lines.

Example: Define a scrolling area and delimit it with a line of text both before and after (File 1). Display a separate text file (File 2) in the scrolling area and display the word Done after you've completed the display.

File No: 1

```
MOVE TO 5, 1
DISPLAY "--- Top ---"
SCROLL LINES 6 TO 8
MOVE TO 9, 1
DISPLAY "--- Bottom --"
MOVE TO 6, 1
DISPLAY FILE 2
MOVE TO 10, 1
DISPLAY "- Done -"
SCROLL LINES 1 to 16  (This line is needed to reset the scrolling
function.)
```

File No: 2

```
DISPLAY "Line 1"
NEW LINE
DISPLAY "Line 2"
NEW LINE
DISPLAY "Line 3"
NEW LINE
DISPLAY "Line 4"
NEW LINE
DISPLAY "Line 5"
```

Graphics Commands

The graphics commands draw boxes, change the video attributes for boxed regions of the screen, and draw bar graphs:

- The BOX command draws a box around text or graphics.
- The EMPTY BOX command draws a box and erases any text or graphics that appear inside.
- The FILL BOX command draws a box and fills it with a single character.
- The BOX ATTRIBUTES command defines the character attributes (such as color) for a boxed region; this is helpful for defining a color for a region.

Each of these ”box” commands is described before the bar graph commands are described.

Generating Boxes and Boxed Regions

The following commands draw boxes from the lower left-hand corner of the box or define a boxed region.

BOX rr X cc {ESC}[= rrr, ccc d

This command creates an outlined box.

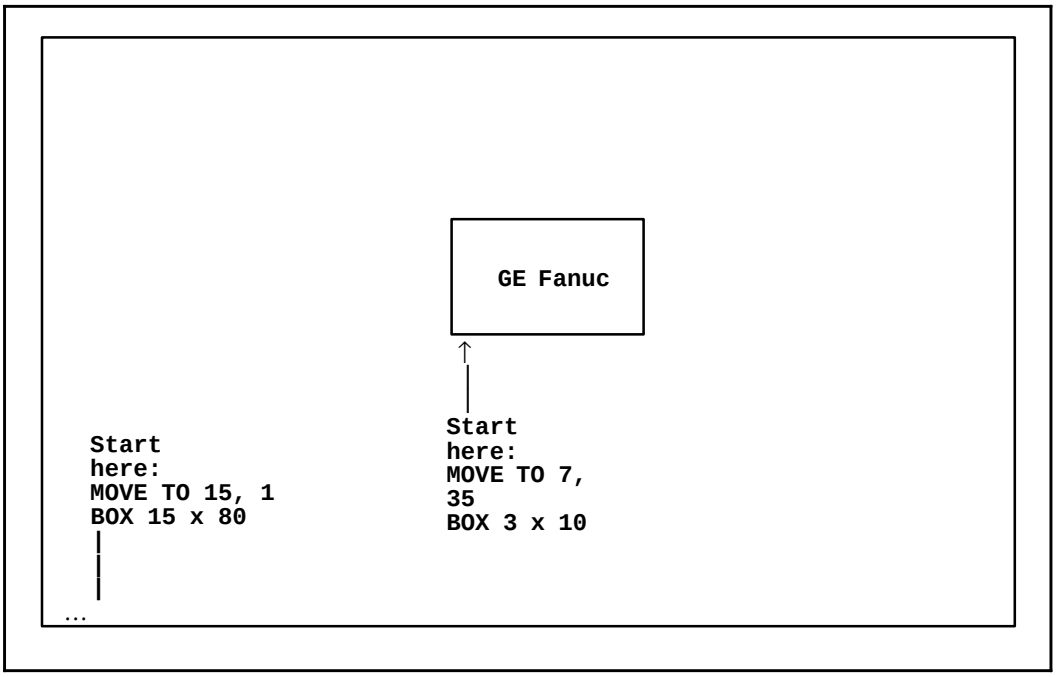
rr - specifies the number of rows up from the cursor that the box extends.

cc - specifies the number of columns to the right from the cursor that the box extends.

The system draws boxes from the lower left-hand corner of the box. Legal cursor positions fall between rows 1 to 25 and between columns 1 to 80. If a box exceeds a legal cursor position, the box wraps around to the opposite side or opposite end of the screen. The lines used for the box outline are two character dots wide and two scan lines high. Both the row specification rr and the column specification cc must be greater than or equal to 2. The BOX command does not change the existing text within a box.

Example 1: Draw two boxes surrounding text in the center of the screen. The first box outlines the text as closely as possible. The second box borders the entire screen.

```
MOVE TO 6, 36
DISPLAY ”GE Fanuc”
MOVE TO 7, 35
BOX 3 x 10
MOVE TO 15, 1
BOX 15 x 80
```



Example 2: Character attributes affect both text and boxes. For example, if you create a box after a DOUBLE WIDE command, the box covers twice as many characters cells as the command states since the system doubles the box width. The following commands draw two double wide text messages surrounded by boxes. The first box appears as a double wide box and the second box appears with normal character attributes.

```
DOUBLE WIDE
MOVE TO 5, 20
DISPLAY ”BOX 1”
MOVE TO 6, 18
BOX 3 x 7
MOVE TO 15, 20
DISPLAY ”BOX 2”
EXIT DOUBLE WIDE AND BLINK
MOVE TO 16, 19
BOX 3 x 11
```

EMPTY BOX rr X cc {ESC}[= rrr; ccc e

This command creates an empty box. This command erases any text or graphics that previously appeared in the boxed region.

rr -specifies the number of rows up from the cursor that the box extends.

cc -specifies the number of columns to the right from the cursor that the box extends.

The system draws boxes from the lower left-hand corner of the box. Legal cursor positions fall between rows 1 to 16 and between columns 1 to 80. If a box exceeds a legal cursor position, the box wraps around to the opposite side or opposite end of the screen. The lines used for the box outline are two character dots wide and two scan lines high. Both the row specification rr and the column specification cc must be greater than or equal to 2.

Example: Create an empty box 12 rows tall by 40 columns wide.

```
MOVE TO 15, 20
EMPTY BOX 12 X 40
```

FILL BOX rr X cc WITH ”a” {ESC} rrr; ccc b a

This command creates a box and fills it with a single character.

rr - specifies the number of rows up from the cursor that the box extends.

cc - specifies the number of columns to the right from the cursor that the box extends.

a - specifies the single ”fill character” value that fills the boxed area. The fill character uses the current foreground and background character attribute settings. If you specify the fill character as a space (a non-printing character), this command fills the region with the setting currently specified by the background attribute.

The system draws boxes from the lower left-hand corner of the box. Legal cursor positions fall between rows 1 to 25 and between columns 1 to 80. If a box exceeds a legal cursor position, the box wraps around to the opposite side or opposite end of the screen. The lines used for the box outline are two character dots wide and two scan lines high. Both the row specification rr and the column specification cc must be greater than or equal to 2.

Example: Fill a box 12 rows by 40 columns with the letter X.

```
MOVE TO 15, 5
FILL BOX 12 X 40 WITH ”X”
```

BOX ATTRIBUTES rr X cc {ESC}[= rrr; ccc a

This command applies the currently defined character attributes to a boxed region.

rr - specifies the number of rows up from the cursor that the box extends.

cc - specifies the number of columns to the right from the cursor that the box extends.

The system determines box attribute regions from the lower left-hand corner of the box. Legal cursor positions fall between rows 1 to 16 and between columns 1 to 80. If a box exceeds a legal cursor position, the box wraps around to the opposite side or opposite end of the screen. The lines used for the box outline are two character dots wide and two scan lines high. Both the row specification rr and the column specification cc must be greater than or equal to 2.

This command does not erase or rewrite any text or graphics that already exist in the box attribute region; it only changes the character attributes for the text or graphics in the region. This command is useful for defining and changing the colors or intensities for text on a screen without rewriting the text after the change.

Example: Define a line of text to read Blower off ON. Then define two sets of box attribute regions. The first box attribute region displays the word off with the default intensity and the word ON in black so that it is hidden. The second box attribute region displays the word off in black so that it is hidden and the word ON in bright on a dim background so that it is highlighted. The second box region includes a box around the word ON to highlight it even more.

Use the [F7] STEP key then the [F6] SHOW key to move through the file and see how the two boxed attribute regions work.

```
'Blower off/on text
MOVE TO 5, 10
DOUBLE WIDE
DISPLAY "Blower off  ON"
MOVE TO 6, 32
BOX 3 x 4
 '
 'Box attributes:  Blower off normal
MOVE TO 5, 24
NORMAL
BOX ATTRIBUTES 1 x 3
MOVE TO 6, 32
DARK
/DARK
BOX ATTRIBUTES 3 x 4
 '
 'Box attributes:  Blower ON highlighted
MOVE TO 5, 24
DARK
BOX ATTRIBUTES 1 X 3
MOVE TO 6, 32
BRIGHT
/DIM
BOX ATTRIBUTES 3 x 4
```

Drawing Bar Graphs

The following commands draw horizontal or vertical bar graphs.

HORIZONTAL BAR GRAPH nn, ff, mm {ESC}[= nnn; fff; mmm h

This command makes a horizontal bar graph that flows toward the right-hand edge of the screen.

nn - represents the number of whole cells for the graphed item in the bar; nn must be expressed as an integer to represent whole character cells.

ff - represents the percentage of a single cell for the bar; ff must be expressed as an integer from 0 to 99.

mm - represents the maximum number of cells for the bar.

When you invoke this command, it generates a bar of whole and fractional cells specified by nn and ff. The command erases any previous bar. The bars use the current foreground and background character attributes.

A single character cell appears 8 pixels "wide." Assuming a full 80 columns for a bar, this results in as many as 640 pixel-formed bars (8 * 80) for a bar graph.

Typically, dynamic bar graphs would be generated through a series of escape sequences issued by the host instead of through the OptiSCREEN command.

Example 1: Temperatures fall between 0 and 100 degrees. Generate a horizontal bar graph that uses a maximum of 10 cells. Show a temperature of 43.5 degrees.

1. Determine the range of the variable to be graphed.

   Range = Maximum - Minimum
   Range = 100 - 0
   Range = 100

2. Determine the maximum number of character cells for the graph.

   mm = 10

3. Decide the scaled actual value for the graph.

   Scaled value = Graph amount * (mm / Range)
   Scaled value = 43.5 * (10 / 100)
   Scaled value = 4.35

4. Determine the number of whole character cells for the graph.

   nn = INT (Scaled value)
   nn = INT (4.35)
   nn = 4

5. Determine the percentage of the remaining character to be graphed.

   ff = (Scaled value - nn) * 100
   ff = (4.35 - 4) * 100
   ff = 35

The resulting bar graph command:

```
HORIZONTAL BAR GRAPH 4, 35, 10
```

Example 2: The count of an inventory item falls between -5 and 50. Generate a horizontal bar graph that uses a maximum of 12 cells. Show a level of 32 items.

1. Determine the range of the variable to be graphed.

   Range = Maximum - Minimum = 50 - (-5) = 55

2. Determine the maximum number of character cells for the graph.

   mm = 12

3. Decide the scaled actual value for the graph.

   Scaled value = Graph amount * (mm / Range) = 32 * (12 / 55) = 6.98

4. Determine the number of whole character cells for the graph.

   nn = INT (Scaled value) = INT (6.98) = 6

5. Determine the percentage of the remaining character to be graphed.

   ff = (Scaled value - nn) * 100 = (6.98 - 6) * 100 = 98

The resulting bar graph command:

```
HORIZONTAL BAR GRAPH 6, 98, 12
```

VERTICALBAR GRAPH nn, ff, mm {ESC}[= nnn; fff; mmm v

This command makes a vertical bar graph that reaches up toward the top of the screen.

nn - represents the number of whole cells for the graphed item in the bar; nn must be expressed as an integer to represent whole character cells.

ff - represents the percentage of a single cell for the bar; ff must be expressed as an integer from 0 to 99.

mm - represents the maximum number of cells for the bar.

When you invoke this command, it generates a bar of whole and fractional cells specified by nn and ff. The command erases any previous bar. The bars use the current foreground and background character attributes.

A single character cell appears 10 pixels "tall." Assuming a full 15 rows for a bar, this results in as many as 240 pixel-formed bars (10 * 15) for a bar graph.

Typically, a dynamic bar graph is generated through a series of escape sequences issued by the host instead of through the OptiSCREEN command.

Example 1: A machine can process from 0 to 1000 objects per hour. Generate a vertical bar graph that uses a maximum of 10 cells. Show 884 objects on the graph.

1. Determine the range of the variable to be graphed.

   Range = Maximum - Minimum
   Range = 1000 - 0
   Range = 1000

2. Determine the maximum number of character cells for the graph.

   mm = 10

3. Decide the scaled actual value for the graph.

   Scaled value = Graph amount * (mm / Range)
   Scaled value = 884 * (10 / 1000)
   Scaled value = 8.84

4. Determine the number of whole character cells for the graph.

   nn = INT (Scaled value)
   nn = INT (8.84)
   nn = 8

5. Determine the percentage of the remaining character to be graphed.

   ff = (Scaled value - nn) * 100
   ff = (8.84 - 8) * 100
   ff = 84

The resulting bar graph command:

```
VERTICAL BAR GRAPH 8, 84, 10
```

Example 2: Fluid levels must be maintained between 10 and 50 gallons. Generate a vertical bar graph that uses a maximum of 8 cells. Show a level of 18.5 gallons.

1. Determine the range of the variable to be graphed.

   Range = Maximum - Minimum = 50 - 10 = 40

2. Determine the maximum number of character cells for the graph.

   mm = 8

3. Decide the scaled actual value for the graph.

   Scaled value = Graph amount * (mm / Range) = 18.5 * (8 / 40) = 3.7

4. Determine the number of whole character cells for the graph.

nn = INT (Scaled value) = INT (3.7) = 3

5. Determine the percentage of the remaining character to be graphed.

   ff = (Scaled value - nn) * 100 = (3.7 - 3) * 100 = 70

The resulting bar graph command:

```
VERTICAL BAR GRAPH 3, 70, 8
```

Programmable Keyboard, Touch Screen, and Function Key Commands

These commands allow you to set and use the programmable keyboard and touch screen capabilities of a Mini OIT. The LOAD FUNCTION KEY command sets and uses the function key capabilities for a Mini OIT.

To program the keyboard or touch screen, you must select ”FIVE” at the KEY CODES line of the Configuration Menu.

Programmable Keyboard Programming

The 65-position sealed membrane keyboard is programmable. The keys can be loaded individually through the LOAD KEY command or they can all be loaded together with one of the internal key tables with the LOAD KEY TABLE command. The internal key table options are Terminal, BASIC, and QWERTY. The character assignments of these key tables are shown in Chapter 1.

Any of the 65 key positions can be programmed as a function key using the LOAD FUNCTION KEY command. Each function key can be programmed to generate a sequence of up to 16 ASCII characters. Not more than 16 keys can become function keys.

On a cold start, the key table is initialized at the same time that the default configuration is loaded. The default and user-defined key values are retained in non-volatile memory.

Touch Screen Programming

Touch Screen programming is done basically the same as for the programmable keyboard except you use the MAKE TOUCH BOX command.

The Programmable Keyboard, Touch Screen and Function Key commands are described below.

Displaying the Current Key Table

To display the current key table, from the Configuration menu, select the current KEY CODES type (ONE-FIVE) and press the [F6] PERFORM key. Only the first 40 keys are displayed. The escape sequence for displaying the current key table is {Esc} [> 97 r.

CLEARKEY TABLE {ESC}[>98r

This command eliminates any previous key table specifications and makes all key values null.

DEFAULT KEY TABLE {ESC}[>99r

This command sets the keys to the default key table as shown below.

A 41	B 42	C 43	D 44	E 45	F 46	G 47	H 48	I 49	J 4A
K 4B	L 4C	M 4D	N 4E	O 4F	P 50	Q 51	R 52	S 53	T 54
U 55	V 56	W 57	X 58	Y 59	Z 5A	[5B	\ 5C	] 5D	^ 5E
_ 5F	' 60	a 61	b 62	c 63	d 64	e 65	f 66	g 67	h 68
i 69	j 6A	k 6B	l 6C	m 6D	n 6E	o 6F	p 70	q 71	r 72
s 73	t 74	u 75	v 76	w 77	x 78	y 79	z 7A	{ 7B	| 7C

Note

Only the top four lines are displayed on the Mini OIT screen.

LOAD KEY nn WITH vvv {ESC} nnn; k r

This programmable keyboard command loads a specific key with a value that you specify. To use the command, specify the key position as a number between 1 and 65, as shown in the figures below:

The following diagrams show the key position numbers associated with the keyboards which can be programmed.

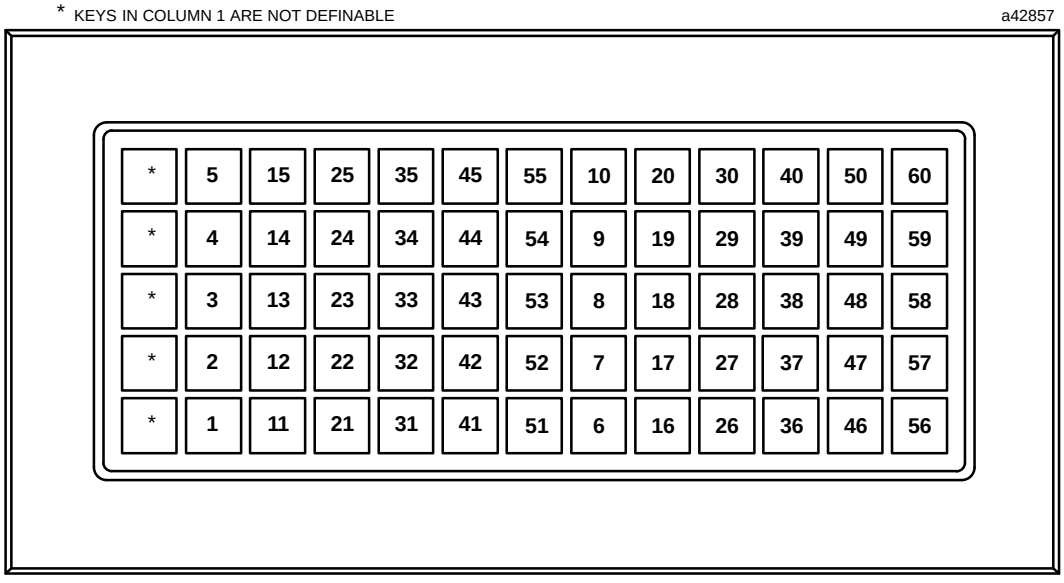


Figure 5-1. Key Location Numbers for the 65-Position Sealed Membrane Keyboard

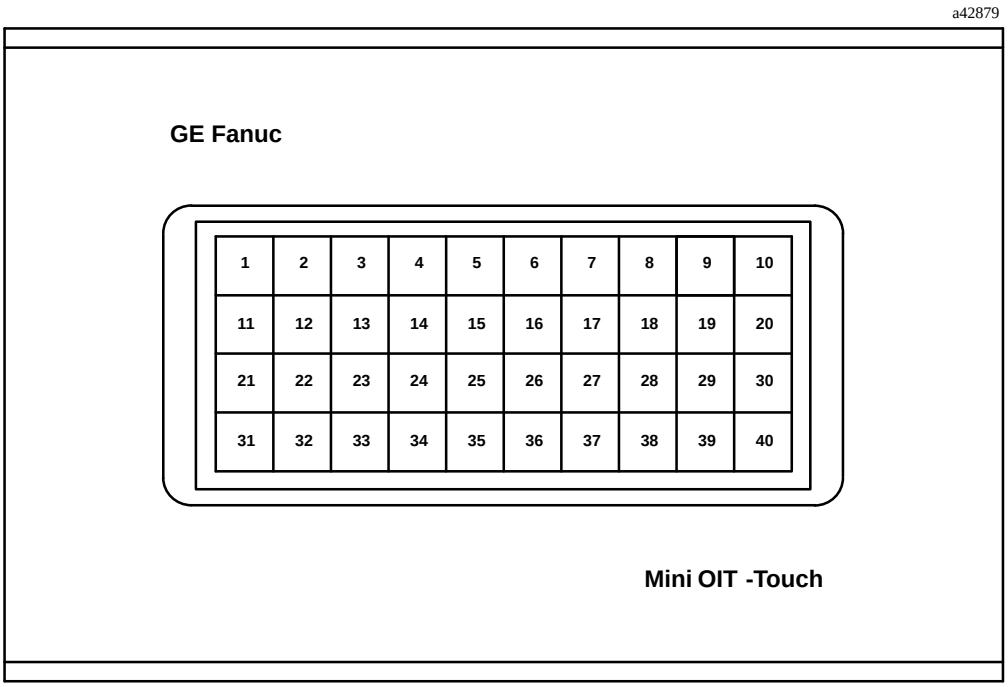


Figure 5-2. Key Location Numbers for the 40-Position MiniOIT Touch Screen

Specify the value of the key to be programmed as a single ASCII character vvv. The capital letters A through Z are indicated by the ASCII numbers 65 through 90, and the lower case letters a through z are indicated by the ASCII numbers 97 through 122.

Key Value:	Output When Activated:
0 to 31	Standard ASCII non-displayable codes*
32 to 127	Standard ASCII displayable codes*
128 to 143	Function key codes F1 to F16
144 to 153	Control-1 to Control-9
154 to 169	Not used
170 to 171	IBM special key codes
172 to 175	Not used
176 to 177	IBM special key codes (Ins, End)
178	Cursor Down
179	IBM special key code (Page Down)
180	Cursor Left
181	Not used
182 to 184	Cursor Right, Home, Up key codes
185	IBM special key code (Page Up)
186 to 191	Not used
192 to 204	IBM special key codes
205 to 254	Not used
255	No keystroke code

* Refer to Appendix B for ASCII Codes.

The key tables contain unshifted, non-control values for 65 available key positions. If used with the 65-position keyboard, all keys except the Reset, Break, Control, Repeat, and Shift keys become user-definable. The Shift and Control keys are inactive. This enables you to define the ASCII code generated by any of the 65 available key positions.

Example: Clear the programmable keyboard specification and load key number 1, with the letter A.

```
CLEAR SCREEN
CLEAR KEY TABLE
LOAD KEY 1 WITH 65
```

MAKE TOUCH BOX nn AT LOCATION pp WITH VALUE vvv {ESC}[> nnn; ppp; vvv s

This touch screen command loads a specific touch zone, or touch key on a touch screen, with a value that you specify. To use the command, specify the size of the touch box as nn at location pp and filled with the ASCII value vvv.

To determine the size and the shape of box nn, specify a number between 1 and 8 as described in the table below:

Touch Pad Size nn	How Many Lines		How Many Columns		Description of Box Interior
	High	Wide	High	Wide	
1	1	1	4	8	Box outline, inside erased
2	1	2	4	16	Box outline, inside erased
3	2	1	8	8	Box outline, inside erased
4	2	2	8	16	Box outline, inside erased
5	1	1	4	8	Box outline only
6	1	2	4	16	Box outline only
7	2	1	8	8	Box outline only
8	2	2	8	16	Box outline only

The system determines all boxes from the lower-left corner of location pp.

Location pp specifies the number between 1 and 40 of the touch-pad key as shown above in the LOAD KEY nn WITH vvv command.

Example: Use the MAKE TOUCH BOX nn AT LOCATION pp WITH VALUE vvv command to create a box at location 37 two touch keys by two touch keys large and specify that the system fill the large box with the letter B.

```
CLEAR SCREEN CLEAR KEY TABLE 'Create the box and fill it with the letter
"B" MAKE TOUCH BOX 4 AT LOCATION 37 WITH VALUE 66
```

LOAD KEY TABLE nn {ESC}]>10n r

This programmable keyboard command loads a predefined key table. Specify key table nn as a number (1, 2, or 4 to correspond with Terminal, BASIC, and QWERTY keyboard layouts).

Example: Load key table 1s.

```
CLEAR SCREEN
CLEAR KEY TABLE
LOAD KEY TABLE 1
```

LOAD FUNCTION KEY nn WITH "text" {ESC} nnn t text {ETX}

This function key command loads function key nn with a value (text). Specify nn as a function key number between 1 and 16, inclusive.

Example: Load function key [F12] with the RUN command.

```
LOAD FUNCTION KEY 12 WITH "RUN"
```

User Programmable I/O Mode Commands

These commands are used to control the parallel port in User Programmable I/O mode. Refer also to a further discussion of the User Programmable I/O Mode in Chapter 3, Installation.

PARALLEL I/O MODE: nnn {Esc}[>nnnp

This command establishes which of the 16 discrete bits of the parallel port are inputs and which are outputs.

nnn -specifies a decimal number from 0 to 65535 which is processed as a 16-bit binary value. This decimal number is calculated by adding the decimal values (shown in the table below) of all bits being set to inputs. A decimal value of 0 will set all bits to outputs. A decimal value of 65535 will set all bits to inputs.

Table 5-2. Parallel Port Bit Values for User Programmable I/O Mode

PIN	BIT	DECIMAL VALUE
6	0	1
7	1	2
8	2	4
9	3	8
10	4	16
11	5	32
12	6	64
13	7	128
16	8	256
17	9	512
18	10	1024
19	11	2048
20	12	4096
21	13	8192
22	14	16384
23	15	32768

Example: Set parallel port data bits 0-7 to inputs and 8-15 to outputs.

Referring to the table above, add together the decimal value of each bit being set to an input. The decimal value of outputs is zero. The sum of the decimal values for bits 0-7 is 255.

```
PARALLEL I/O MODE: 255
```

INPUT PARALLELDATA {Esc}[>i

This command inputs the status of each bit on the parallel port. The value received is a decimal number that is decoded by using the table of bit values above. A received decimal value of 10, for example, would be decoded as bits 1 and 3 being ”On” and all other bits being ”Off”.

OUTPUT PARALLELDATA: nnn {Esc}[>nnno

This command outputs data to the parallel port.

nnn - specifies a decimal value corresponding to the desired status of each bit. This decimal value is calculated by adding the decimal value (in the table under the PARALLEL I/O MODE command) of each bit to be "On".

Example: Turn data bits 1 and 8 of the parallel port "On". The sum of the decimal values of bits 1 and 8 is 258.

```
OUTPUT PARALLEL DATA: 288
```

Data Fill Operations

In many situations, you will want to create a screen file that includes numerous blanks for the host to later fill in with data. In order to fill in these blanks, the host must perform some form of cursor positioning before sending the data for the blank field. To simplify the cursor positioning the Screen Display and Data Fill escape sequence (Esc [> n f) has been developed.

To perform this operation you will normally create two screen files, using the OptiSCREEN Editor. Screen file 1 will contain the text portion of the screen only. Screen file 2 will contain special place holders in the form of [Ctrl]-E {ENQ} characters where data from the host is to be sent.

First, the host will display file 1, the text portion of the screen, using the Screen Display escape sequence (Esc [> n w). Next, when the host is ready to send data, it will use the Screen Display and Data Fill escape sequence (Esc [> n f) to display the screen file 2 containing the blank space place holders. Then the host sends the data. When the host is ready to send data again it uses the Screen Display and Data Fill escape sequence to display the blanks only before sending data.

When the Screen Display and Data Fill escape sequence is executed, the screen will be processed only up to the first [Ctrl-E] encountered. At this point, data received from the host in On-Line mode, or from the keyboard in Local mode, will be placed on the screen instead of spaces. As each additional character is received, it will be used to fill the blanks in the file where [Ctrl]-E was placed. As the screen file is being processed, when a character other than [Ctrl]-E is again encountered, normal file display will resume.

If a non-displayable character is received in the data to be filled in on the screen (e.g. a carriage return, line feed), spaces will automatically be put on the screen for each [Ctrl]-E in the same data field. A field is considered to end when a character other than [Ctrl]-E is found in the display file. In this manner a field of 6 [Ctrl]-Es for a particular data value may use fewer than 6 characters and be left justified in the blanks reserved for the data.

The host or application program can terminate a Data Fill sequence prior to sending all of the characters required to fill the fields on the screen by sending a [Ctrl]-C (End of Text). In this manner, only the highest priority fields on the screen can be updated if desired.

The format for the Display File and Data Fill escape sequence (normally sent from the host) is:

Esc [> n f data data data ... data ETX

The file number is n; the ETX is optional and only required if fewer data characters are sent than the blank fields in the file. An example of this operation is shown below.

Example Data Fill Operation

The display below is created using two separate screen files. Lower-case e's are used to show where the fill character ([Ctrl]-E) has been placed.

```
CURRENT SETPOINT:  eeeee
CURRENT HIGH ALARM:  eeeee
CURRENT LOW ALARM:  eeeee

CURRENT TEMPERATURE:  eeeee
HIGHEST TEMPERATURE THIS BATCH:  eeeee
LOWEST TEMPERATURE THIS BATCH:  eeeee
```

The text of the screen was created by the OptiSCREEN Editor as shown below:

```
CLEAR SCREEN
HOME
DISPLAY "CURRENT SET POINT:"
MOVE 1, 2
DISPLAY "CURRENT HIGH ALARM:"
MOVE 1, 3
Â
Â
Â
END
```

A second file was then created to include the blank space place holders.

```
MOVE TO 1, 20
DISPLAY "{ENQ}{ENQ}{ENQ}{ENQ}{ENQ}"     The {ENQ} character is the
MOVE T0 2, 22                           blank space created by
DISPLAY "{ENQ}{ENQ}{ENQ}{ENQ}{ENQ}"     pressing Ctrl-E.
MOVE TO 3, 19
Â
Â
Â
END
```

In the example above, the operations in the first file could have been included in the second file. But, using a separate file for the data fill operation allows the host to repeat displaying of data without redisplaying the text portion of the screen.

The following Series Five ASCII/BASIC program running in the host could be used to display the file and then fill in the blanks. Note that the syntax used in this example may vary depending upon the type of BASIC being used.

```
10 PRINT CHR(27),"[>1w"  : REM print screen one
20 PRINT CHR(27),"[>2f"  : REM print screen two fill command

30 . . .
40 . . .
50 PRINT A               : REM first data field
60 PRINT B               : REM second data field
Â
Â
Â
```

In the above example, it was assumed that the variables A and B would be 5 characters or less. Each of the BASIC Print statements will send a Carriage Return and Line Feed after each variable. If a variable was less than 5 characters, then spaces would automatically be used to pad out the fields. Therefore, each field is automatically left-justified and trailing spaces are added as needed to erase old data that may have been in the field.

Command Summary

The following command summary gives the format, a short description for each command, and the page number where the command is fully documented. In the following summary, brackets appear around optional arguments.

'comment (Comment) Specifies that the rest of the line is a comment.

[Ctrl]-E {ENQ} (Data Fill) Holds space on display for character sent from host.

ATTRIBUTES: [nn,] nn, nn (Character attribute) Establishes two or more character attributes as the current mode.

BLINK (Character attribute) Establishes the blinking character attribute mode.

BLINKING CURSOR (Cursor) Makes the cursor blink on the screen.

BLOCK CURSOR (Cursor) Makes the cursor appear as a solid block.

BOX ATTRIBUTES rr X cc (Graphics) Applies the currently defined character attributes to a boxed region rr rows tall and cc columns to the right.

BOX rr X cc (Graphics) Creates an outlined box rr rows tall and cc columns to the right.

BRIGHT and /BRIGHT (Character attribute) Sets the monochrome foreground and background intensity to higher than normal.

BRIGHT UNDERLINE (Character attribute) Sets the monochrome foreground intensity level to BRIGHT and underlines the text.

CLEARKEY TABLE (Programmable Keyboard) Makes all programmable key values null.

CLEARLINE (Erasing and editing) Clears the contents of the current line.

CLEARLINE FROM CURSOR (Erasing and editing) Clears the contents of the current line from the cursor to the end of the line.

CLEARLINE T0 CURSOR (Erasing and editing) Clears the contents of the current line from the beginning of the line to the cursor.

CLEARSCREEN (Erasing and editing) Moves the cursor to the home position, clears the screen, and resets all attributes to normal.

CLEARSCREEN FROM CURSOR (Erasing and editing) Clears the screen from the cursor to the end of the screen.

CLEARSCREEN TO CURSOR (Erasing and editing) Clears the screen from the home position to the cursor.

CURSOR (Cursor) Makes the cursor visible.

DARK and /DARK (Character attribute) Sets the monochrome foreground and background intensity to dark.

DEFAULT KEY TABLE (Programmable keyboard) Sets the programmable keyboard to the default key table.

DELETECHARACTER (Erasing and editing) Erases one character.

DELETELINE (Erasing and editing) Deletes one line.

DIM and /DIM (Character attribute) Sets the monochrome foreground and background intensity to lower than normal.

DIM UNDERLINE (Character attribute) Sets the monochrome foreground intensity level to DIM and underlines the text.

DISABLECURSOR (Cursor) Disables cursor on the screen.

DISPLAY "text" (Display) Displays the string text.

DISPLAY FILE (File display) Displays OptiSCREEN file nn.

DISPLAY FILE nnn FROM BANK nnn (File display) Displays OptiSCREEN file from specified bank.

DOUBLESIZE TOP/BOTTOM LINE (Line attribute) Establishes double size as the current line attribute mode.

DOUBLEWIDE (Character attribute) Establishes the double wide character set as the current mode.

DOUBLEWIDE LINE (Line attribute) Establishes double wide as the current line attribute mode.

DOWN [nn] (Cursor) Moves the cursor down one or nn rows.

EMPTY BOX rr X cc (Graphics) Creates an empty box rr rows tall and cc columns to the right.

END (End of File) Indicates the end of the OptiSCREEN file.

EXIT DOUBLE WIDE AND BLINK (Character attribute) Resets the double wide and blinking character attributes to normal.

EXIT QUAD (Character attribute) Exits the quad character set.

EXIT SUPPLEMENTAL (Character attribute) Exits the supplemental character set.

FILL BOX rr X cc WITH "a" (Graphics) Creates a box rr rows tall and cc columns to the right filled with character a.

HOME (Cursor) Moves the cursor to row 1 and column 1.

HORIZONTAL BAR GRAPH nn, ff, mm (Graphics) Generates a horizontal bar graph nn whole cells to the right, ff (0 to 99) fractional cells to the right, and mm maximum cells to the right.

INDEX (Cursor) Moves the cursor down one row.

INSERT LINE (Erasing and editing) Inserts one line below the cursor.

LEFT [nn] (Cursor) Moves the cursor left one or nn columns.

LINE rr (Cursor) Moves the cursor to the beginning of line rr.

LOAD FUNCTION KEY nn WITH "text" (Function key) Loads function key nn with ASCII values text.

LOAD KEY nn WITH vvv (Programmable keyboard) Loads key nn with character vvv.

LOAD KEY TABLE nn (Programmable keyboard) Loads key table nn.

MAKE TOUCH BOX nnn AT LOCATION nnn (Touch screen) Creates a touch move at a specified location on the screen.

MOVE TO rr [, cc] (Cursor) Moves the cursor to row rr and column cc.

NEW LINE (Cursor) Moves the cursor down to the beginning of the new line.

NO CURSOR (Cursor) Disables the cursor on the screen.

NORMAL and /NORMAL (Character attribute) Sets the monochrome foreground and background intensity to normal.

QUAD SIZE (Character attribute) Establishes the quad character set as the current mode.

RESET ATTRIBUTES (Character attribute) Resets all character attributes to the default.

RESET LINE ATTRIBUTES (Line attribute) Resets all line attributes to the default operating mode.

RESTORE POSITION (Cursor) Returns the cursor to the location stored with SAVE POSITION.

REVERSE INDEX (Cursor) Moves the cursor up one row.

REVERSED (Character attribute) Establishes the reverse video character attribute mode.

RIGHT [nn] (Cursor) Moves the cursor right one or nn columns.

SAVE POSITION (Cursor) Stores the current location of the cursor for recall with RESTORE POSITION.

SCROLL LINES nn TO pp (Erasing and editing) Specifies the top line of the scrolling region as nn and the bottom line as pp.

SINGLE SIZE LINE (Line attribute) Establishes single size as the current line attribute mode.

STEADY CURSOR (Cursor) Makes the cursor non-blinking on the screen.

SUPPLEMENTAL (Character attribute) Establishes the supplemental character set as the current mode.

UNDERLINE (Character attribute) Sets the monochrome foreground intensity level to normal and underlines the text.

UNDERLINE CURSOR (Cursor) Makes the cursor appear as an underline character.

UP [nn] (Cursor) Moves the cursor up one or nn rows.

VERTICAL BAR GRAPH nn, ff, mm (Graphics) Generates a vertical bar graph nn whole cells up, ff (0 to 99) fractional cells up, and mm maximum cells up.

Chapter 6 Utility Programs for the IBM PC

Introduction

With only a keyboard and the Mini OIT, you can create, append, and delete screen files as well as program the function keys.

Included with each Mini OIT is a set of utility programs intended to enhance screen editing operations. (These utility programs are provided on a floppy diskette under the manufacturer's logo.) These programs, as well as the following material describing their application, are provided through GE Fanuc Automation by the manufacturer of the Mini OIT to aid in the development of application programs and screens.

Note

With respect to these utility programs, GE Fanuc Automation North America Inc. makes no warranty or representation whatsoever and the entire risk, of whatever kind, arising out of the use of such programs is assumed by the user.

Starting-Up the Utilities

If you are using the utilities on a GE Fanuc Automation computer such as the Workmaster or Cimstar™ computer, you must first change the IWS.BAT file from:

```
BASICA IWS/C:20000
```

to

```
GWBASIC IWS/C:20000
```

and put GWBASIC in the "Path" of the computer.

Note

GWBASIC is compatible with BASICA A3.10, therefore GWBASIC can be substituted for BASICA in the instructions below.

If you are using the utilities on an IBM PC or compatible other than a GE Fanuc Automation computer, put BASICA in the "Path" of the computer.

To execute a program, select the drive containing the utilities, then type:

```
IWS
```

```
                                IWS UTILITIES
                IWS BACKUP/RESTORE AND DOCUMENTATION UTILITY PROGRAMS
                  (v 2.32) SELECT DESIRED PROGRAM:
1 - IWSLINK  ....User Memory Backup/Restore - For backup of all IWS
                 memory including screens, Optibasic, and user data

2 - IWSBAS*  ....Upload/Download OptiBASIC Programs -
                 For documenting OptiBasic programs.
3 - IWSFILE  ....Upload/Download OptiScreen screen files -
                 For documenting OptiScreen screen files.
4 - IWSEDIT  ....Screen Development, Editing, Up/Downloading - For IWS
                 units without OptiScreen (Firmware 2.1 and below)

5 - GENERAL OPERATING, COMPATIBILITY & CABLING INSTRUCTIONS
6 - EXIT TO DOS
```

* IWSBAS is not used with the Mini OIT.

Next, select the desired program from the Main Menu. Select ”5” from the menu for operating instructions and cabling information.

It is not necessary to use the IWSEDIT editor with OITs that offer the built-in OptiSCREEN Editor. Use the IWSEDIT editor with OITs containing firmware release 2.1 or earlier.

The function of each menu item is described below.

IWSLINK - User Memory Backup/Restore

Note

Ignore references to secondary port which appear in the software. Use the primary (serial) port.

This program emulates a STRLINK III digital cassette recorder. This recorder is used by many programmable controller manufacturers for tape program backup. The OIT includes standard commands for this function.

For those users not having access to a STRLINK III, the IWSLINK utility program allows an IBM compatible computer to emulate a STRLINK III. This program provides a one-step complete backup of all user memory. This backup image can later be reloaded into one or more Operator Interface Terminals.

The file created with this program has the extension .IWS. Except for very experienced programmers, these files would not be used for any other purposes.

Follow the instructions below prior to executing IWSLINK.

1. This program must be executed using IBM compatible BASICA. It was written under DOS 3.0 and BASICA A3.10, other versions of DOS and BASICA except for GWBASIC are not guaranteed to work.
2. Use either the IWS.BAT program to begin operation from DOS, or be sure to set the communication buffer size to 20000 bytes by entering at the DOS prompt the following:

```
BASICA IWSLINK /C:20000
```

3. This program uses the PC COM1 port, and the OIT primary port.
4. This program assumes the default drive is a hard disk. If your default drive is not a hard disk, slower baud rates may have to be used.
5. The baud rate is fixed at 9600, using 8 bits, no parity. You may edit this program to use COM2 or slower baud rates, however, 8 bit word length must be maintained.
6. For Firmware Releases prior to 2.0 the OIT should be set to SPACE parity, for Release 2.0 and later set the OIT to 8 bit, none parity, with hardware handshaking.
7. The cable between the OIT and an IBM PC async card is 2-3, 3-2, and 7-7 with pins 5 and 20 jumpered together at the OIT end. Jumpering at the PC end may be required, and other models of PC communication cards will frequently have different pinouts.
8. If an error occurs, reset the OIT, check the configuration, and type RUN to restart this program.

IWSFILE - Upload/Download OptiSCREEN files

This program is specifically designed to take OptiScreen screen files developed on an OIT, and upload them to disk where they can be stored, edited using a variety of editors, and subsequently downloaded back into an OIT.

The files stored on disk are given a name by the user, and are automatically given the filename extension of .FIL

Primary Port 1 of the OIT must be configured for 9600 baud, NONE parity, 8 data bits, 1 stop bit, SOFT, Point to Point.

You must run this utility for each screen file you wish to Upload or Download

Connect the cable from the IBM PC to Primary Port 1 of the OIT.

IWSEDIT - Screen Development, Editing, Up/Downloading for OITs without OptiSCREEN

The IWS SCREEN EDITOR is designed to allow the creation, editing, and storage of OIT screen files on an IBM compatible personal computer.

It allows files stored on disk to be downloaded to an OIT, as well as uploaded from an OIT to a disk.

The user can create complete libraries of screens on disk that can be used individually or in combination for a variety of projects.

While an understanding of OIT commands (Escape Sequences) is useful, most of the frequently used functions can be performed using menu driven sequences in this program.

The first function this program performs is to verify that an OIT is connected and communicating over the IBM COM1 port. It requests the operator to type the number 1, and if a 1 is received, it indicates that a communications link has been established. If a 1 is not received, a message that the link has not been established is given and the

operator should verify that the OIT is properly connected and configured prior to continuation.

At this time, the editor menu is displayed, and any text entered on the IBM PC's keyboard, will be automatically transmitted to the IWS and displayed on the screen. The characters will also be displayed on the bottom of the IBM screen. Any control characters or command sequences will also be displayed in this region.

Also at the bottom of the screen will be displayed the total number of characters entered for the screen, and the current character position, which may not be at the end of the screen.

Appendix A Mounting Diagrams

This section includes mounting diagrams for the Mini OIT.

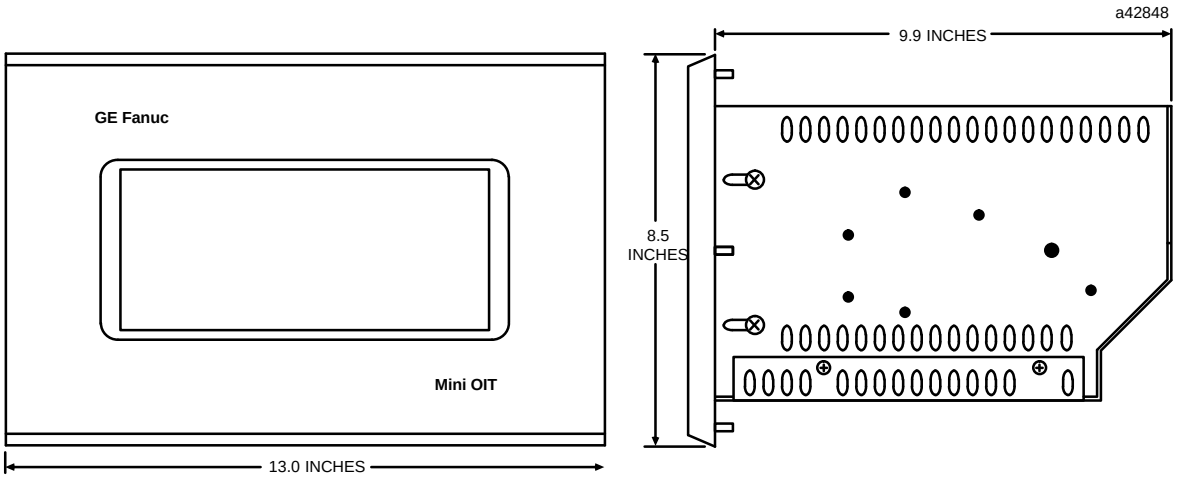


Figure A-1. Dimensions of the Mini OIT

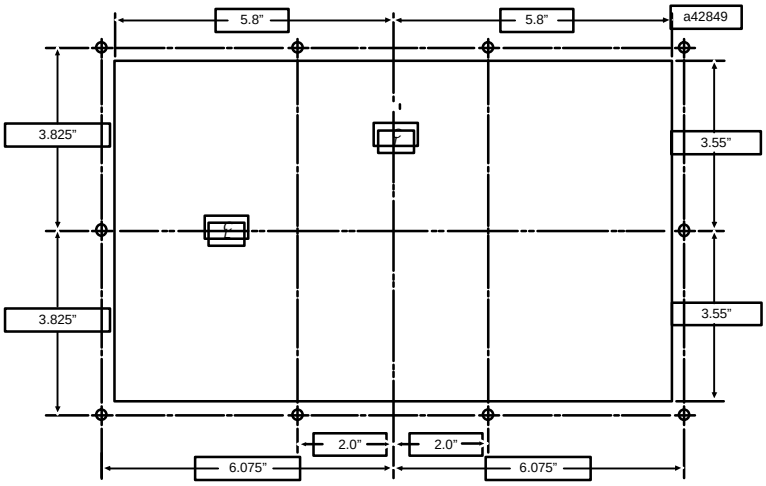


Figure A-2. Mounting Diagram for the Mini OIT

Appendix B

ASCII Codes and Special Character Sets

The Mini OIT uses standard ASCII codes for display and communication. Additionally, the Mini OIT offers special Supplemental Standard graphics, and Quad Size character sets.

ASCII Codes and Characters

The decimal values, hexadecimal values, characters, and descriptions for the standard ASCII characters appear below. Characters marked with an asterisk (*) are not processed.

Decimal	Hex	Character	Description
0	00	[Ctrl]-@	NUL, null or tape feed*
1	01	[Ctrl]-A	SOH, start of header
2	02	[Ctrl]-B	STX, start of text
3	03	[Ctrl]-C	ETX, end of text
4	04	[Ctrl]-D	EOT, end of transmission
5	05	[Ctrl]-E	ENQ, enquiry
6	06	[Ctrl]-F	ACK, acknowledge*
7	07	[Ctrl]-G	BEL, external bell output
8	08	[Ctrl]-H	BS, backspace
9	09	[Ctrl]-I	HT, horizontal tab
10	0A	[Ctrl]-J	LF, line feed
11	0B	[Ctrl]-K	VT, vertical tab*
12	0C	[Ctrl]-L	FF, form feed
13	0D	[Ctrl]-M	CR, carriage return
14	0E	[Ctrl]-N	SO, shift out
15	0F	[Ctrl]-O	SI, shift in
16	10	[Ctrl]-P	DLE, data link escape
17	11	[Ctrl]-Q	DC1, device control 1, XON
18	12	[Ctrl]-R	DC2, device control 2*
19	13	[Ctrl]-S	DC3, device control 3, XOFF
20	14	[Ctrl]-T	DC4, device control 4*
21	15	[Ctrl]-U	NAK, negative acknowledge*
22	16	[Ctrl]-V	SYN, synchronous idle*
23	17	[Ctrl]-W	ETB, end of transmission block
24	18	[Ctrl]-X	CAN, cancel escape sequence
25	19	[Ctrl]-Y	EM, end of medium*
26	1A	[Ctrl]-Z	SUB, substitute*
27	1B	[Ctrl]-[	(left square bracket) ESC, esc

Decimal	Hex	Character	Description
28	1C	[Ctrl]-\	(backslash)FS, file separator*
29	1D	[Ctrl]-]	(right square bracket) GS, group separator
30	1E	[Ctrl]-^	(caret) RS, record separator
31	1F	[Ctrl]-_	(underscore) US, unit separator*
32	20	[Space]	
33	21	!	(exclamation point)
34	22	“	(double quotation mark)
35	23	#	(hatch, number sign, or pound)
36	24	$	(dollar sign)
37	25	%	(percent sign)
38	26	&	(ampersand)
39	27	’	(apostrophe or single right quote)
40	28	(	(left or open parenthesis)
41	29	)	(right or close parenthesis)
42	2A	*	(asterisk or star)
43	2B	+	(plus sign)
44	2C	,	(comma)
45	2D	-	(minus sign, hyphen, or dash)
46	2E	.	(period or dot)
47	2F	/	(slash or forward slash)
48	30	0	(zero)
49	31	1	
50	32	2	
51	33	3	
52	34	4	
53	35	5	
54	36	6	
55	37	7	
56	38	8	
57	39	9	
58	3A	:	(colon)
59	3B	;	(semicolon)
60	3C	<	(less than)
61	3D	=	(equals)
62	3E	>	(greater than)
63	3F	?	(question mark)
64	40	@	(at sign)
65	41	A	(begin uppercase letters)
66	42	B	
67	43	C	
68	44	D	
69	45	E	
70	46	F	
71	47	G	
72	48	H	
73	49	I	
74	4A	J	
75	4B	K	
76	4C	L	
77	4D	M	
78	4E	N	

Decimal	Hex	Character	Description
79	4F	O	
80	50	P	
81	51	Q	
82	52	R	
83	53	S	
84	54	T	
85	55	U	
86	56	V	
87	57	W	
88	58	X	
89	59	Y	
90	5A	Z	(end uppercase letters)
91	5B	[	(left or open bracket
92	5C	\	(backslash or reverse slash)
93	5D	]	(right or close square bracket)
94	5E	^	(up arrow sign or caret)
95	5F	_	(underscore)
96	60	’	(grave accent or single left quote)
97	61	a	(begin lowercase letters)
98	62	b	
99	63	c	
100	64	d	
101	65	e	
102	66	f	
103	67	g	
104	68	h	
105	69	i	
106	6A	j	
107	6B	k	
108	6C	l	
109	6D	m	
110	6E	n	
111	6F	o	
112	70	p	
113	71	q	
114	72	r	
115	73	s	
116	74	t	
117	75	u	
118	76	v	
119	77	w	
120	78	x	
121	79	y	
122	7A	z	(end lowercase letters)
123	7B	{	(left or open squiggly brace)
124	7C	|	(vertical line)
125	7D	}	(right or open squiggly brace)
126	7E	~	(tilde)
127	7F	DEL	(delete or rubout)
128	80	[F1]	(begin function keys)

Decimal	Hex	Character	Description
129	81	[F2]	
130	82	[F3]	
131	83	[F4]	
132	84	[F5]	
133	85	[F6]	
134	86	[F7]	
135	87	[F8]	
136	88	[F9]	
137	89	[F10]	
138	8A	[F11]	
139	8B	[F12]	
140	8C	[F13]	
141	8D	[F14]	
142	8E	[F15]	
143	8F	[F16]	(end function keys)
144	90	[Ctrl]-0	(begin control keys
145	91	[Ctrl]-1	
146	92	[Ctrl]-2	
147	93	[Ctrl]-3	
148	94	[Ctrl]-4	
149	95	[Ctrl]-5	
150	96	[Ctrl]-6	
151	97	[Ctrl]-7	
152	98	[Ctrl]-8	
153	99	[Ctrl]-9	(end control keys)
154-	9A-		not used
169	A9		
170-	AA-		IBM special key codes
171	AB		
172-	AC-		not used
175	AF		
176-	B0-		IBM special key codes
177	B1		
178	B2		Cursor down
179	B3		IBM special key code (page down)
180	B4		Cursor left
181	B5		not used
182	B6		Cursor right
183	B7		Home
184	B8		Up
185	B9		IBM special key code (page up)
186-	BA-		not used
191	BF		
192-	C0-		IBM special key codes
204	CC		
205-	CD-		not used
254	FE		
255	FF		no keystroke

Supplemental Standard Graphics Set

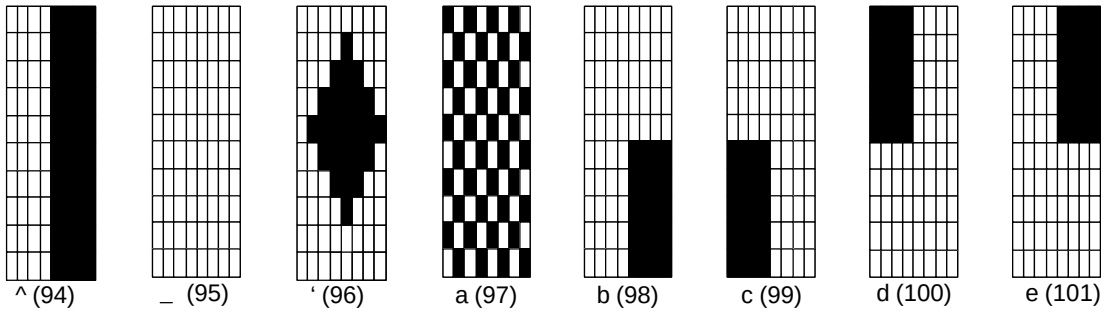
From the Standard Character Set, you can enter the Supplemental Standard Graphics Set with the OptiSCREEN SUPPLEMENTAL command. Return to the Standard Character Set with the EXIT SUPPLEMENTAL command.

The Supplemental Standard Set includes the following:

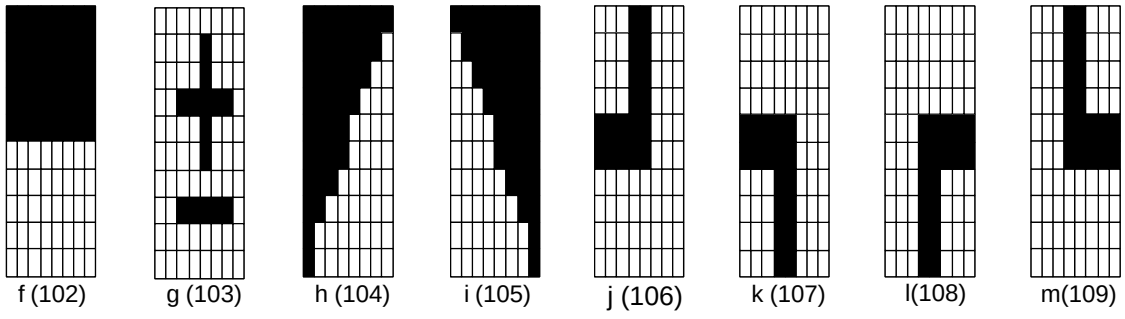
numbers 0 to 9 uppercase A to Z space ! ″ # $ % & ’	( ) * + , - . /]	: ; < = > ? @ [\

The Supplemental Standard Graphics Set appears below.

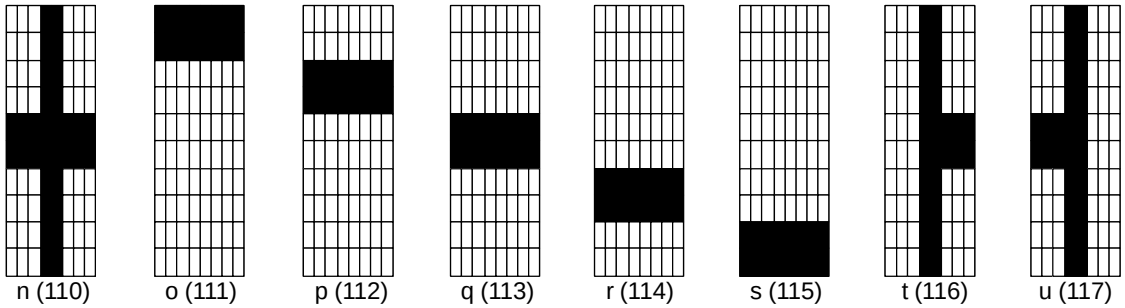
a44106



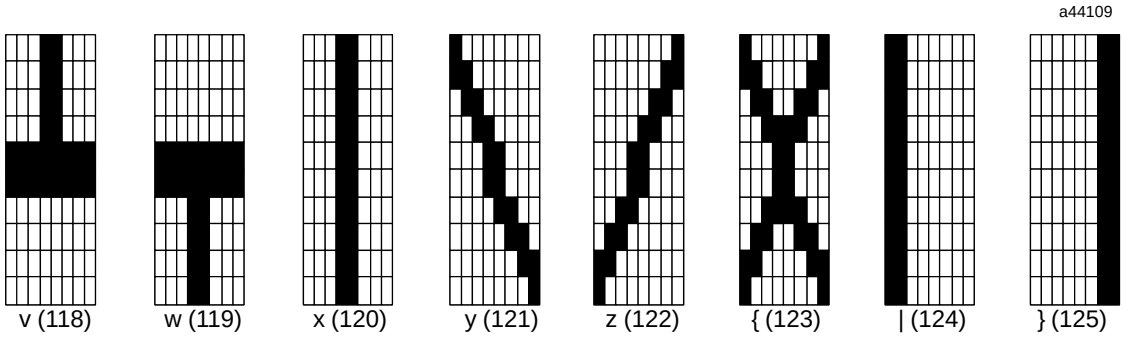
a44107



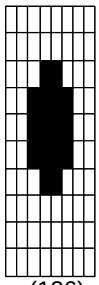
a44108



a44109



a44110



Quad Size Character Set

From the Standard Character Set, you can enter the Quad Size Character Set with the OptiSCREEN QUAD command. Return to the Standard Character Set with the EXIT QUAD command.

The Quad Size Character Set includes the following:

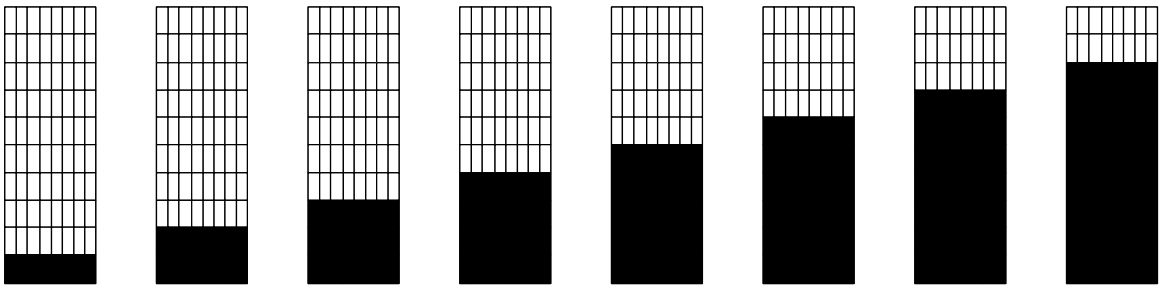
numbers 0 to 9 uppercase A to Z space ! * +	, - . = ?

Alternate Graphics Set

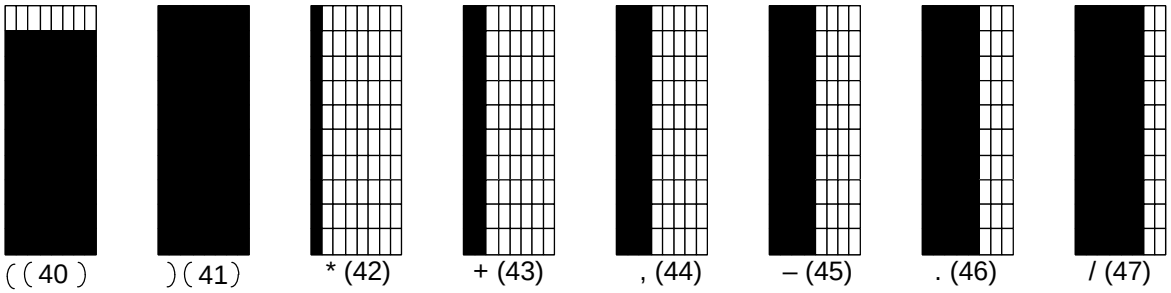
From the Standard Character Set, you can enter the Alternate Graphics Set with the OptiSCREEN ALTERNATE command. Return to the Alternate Graphics Set with the EXIT ALTERNATE command.

The Alternate Graphics Set appears below.

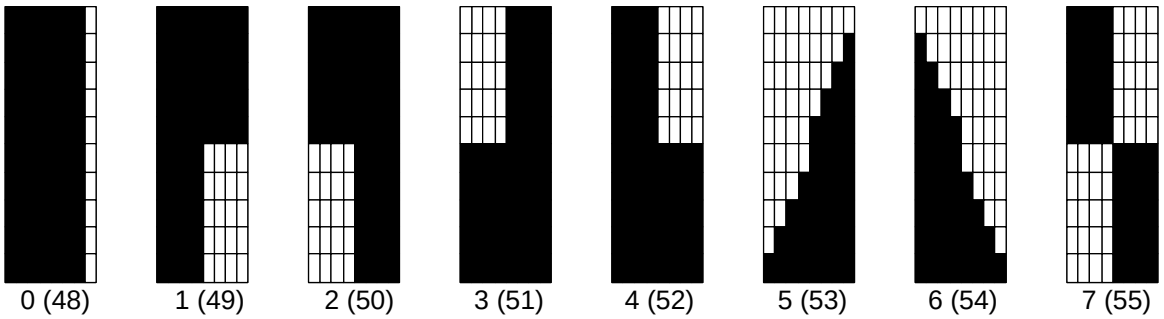
a44111



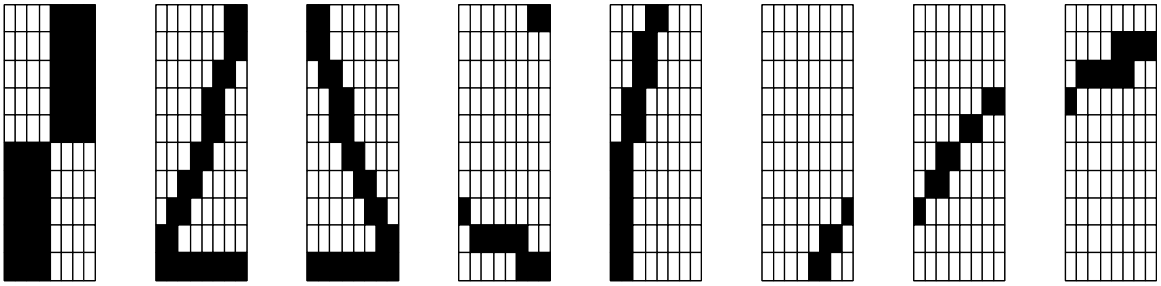
a44112



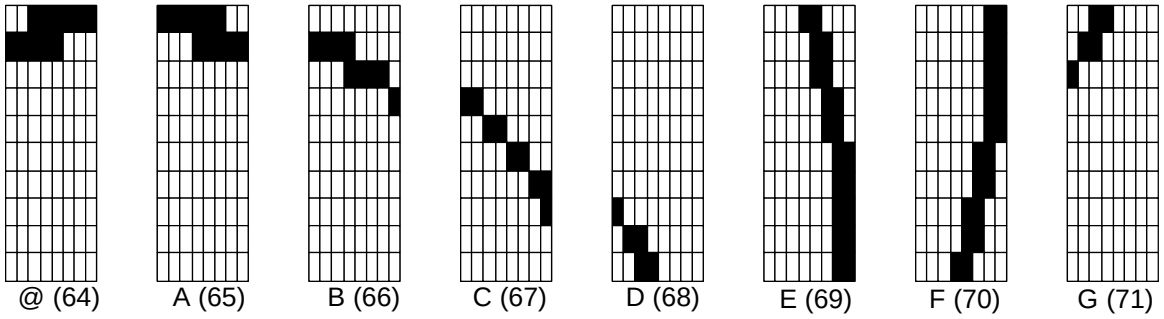
a44113



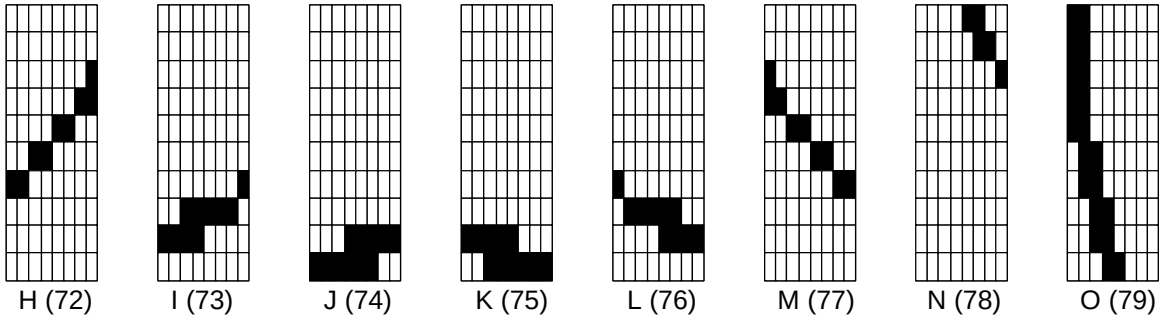
a44114



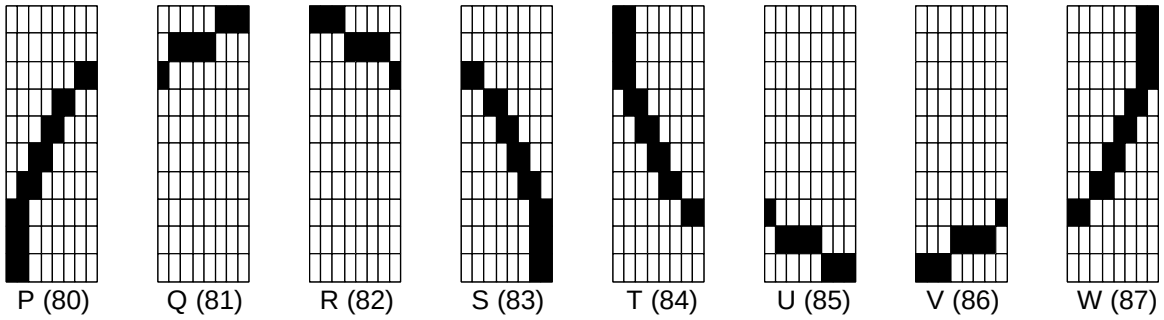
a44115



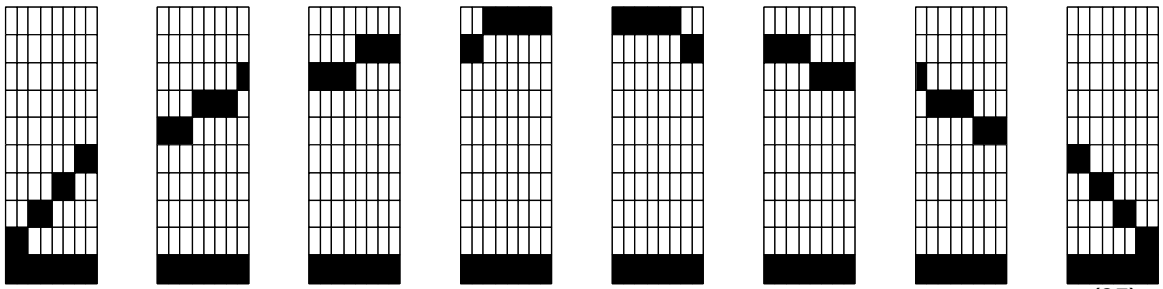
a44116



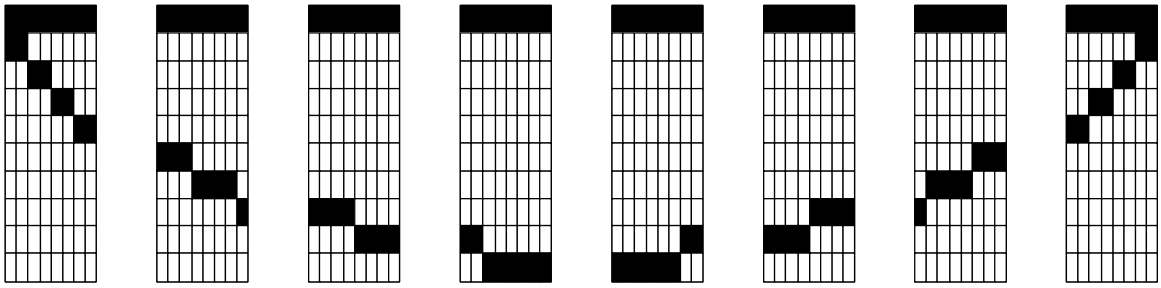
a44117



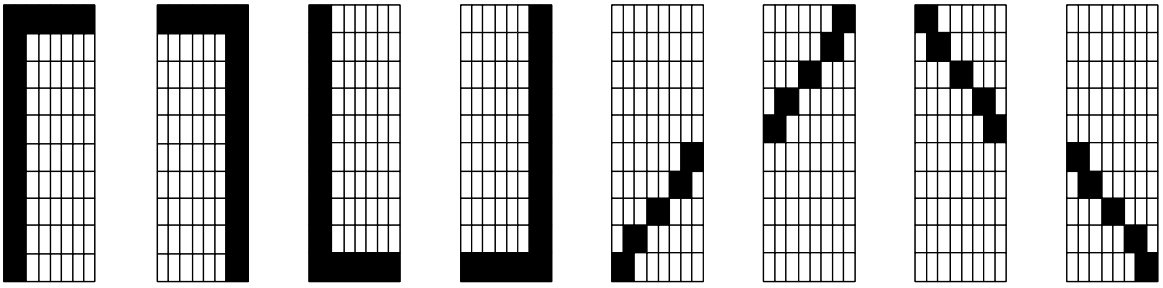
a44118



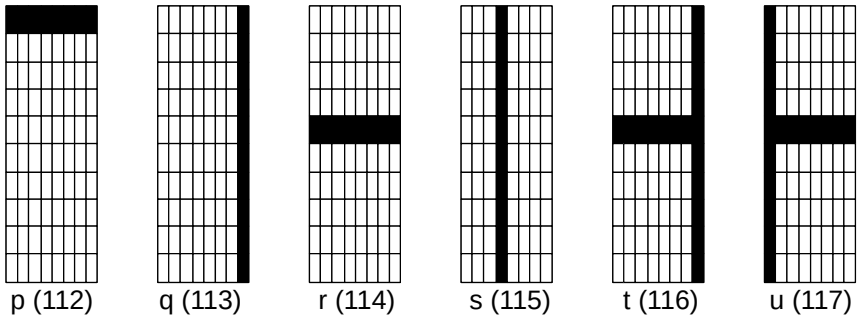
a44119



a44120



a44121

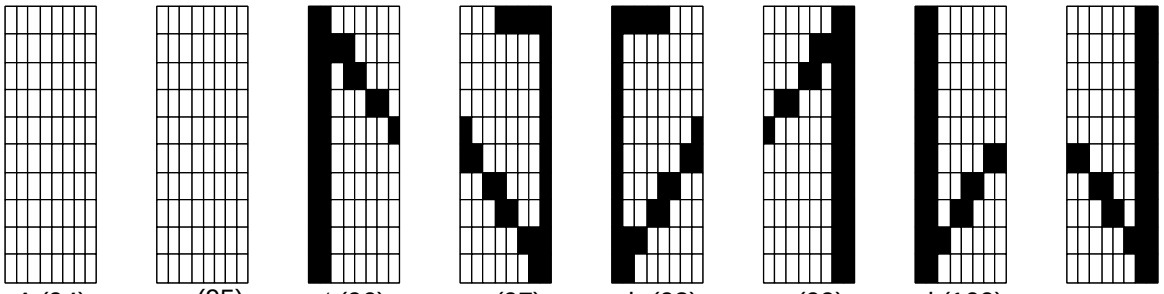


Supplemental Alternate Graphics Set

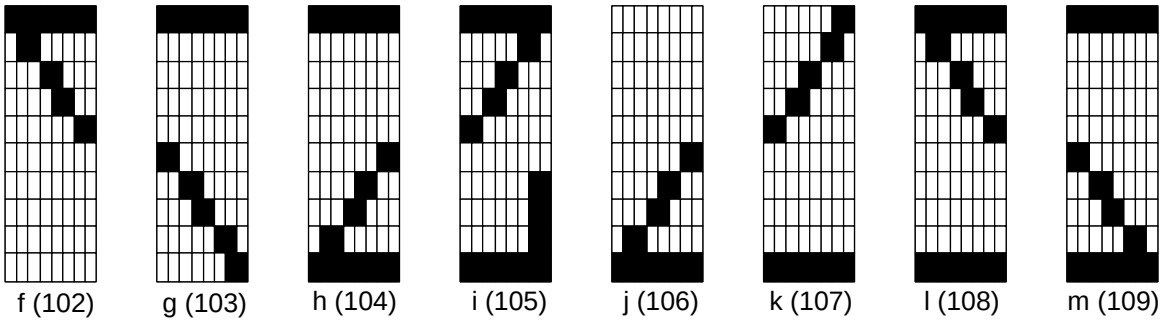
From the Alternate Graphics Set (described above), you can enter the Supplemental Alternate Graphics Set with the OptiSCREEN SUPPLEMENTAL command. Return to the Alternate Graphics Set with the EXIT SUPPLEMENTAL command.

The Standard Supplemental Graphics Set appears below.

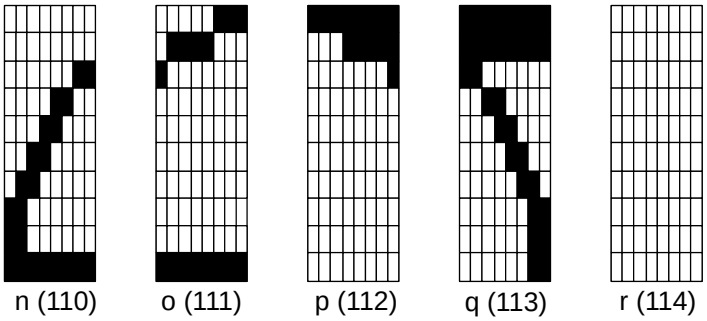
a44122



a44123

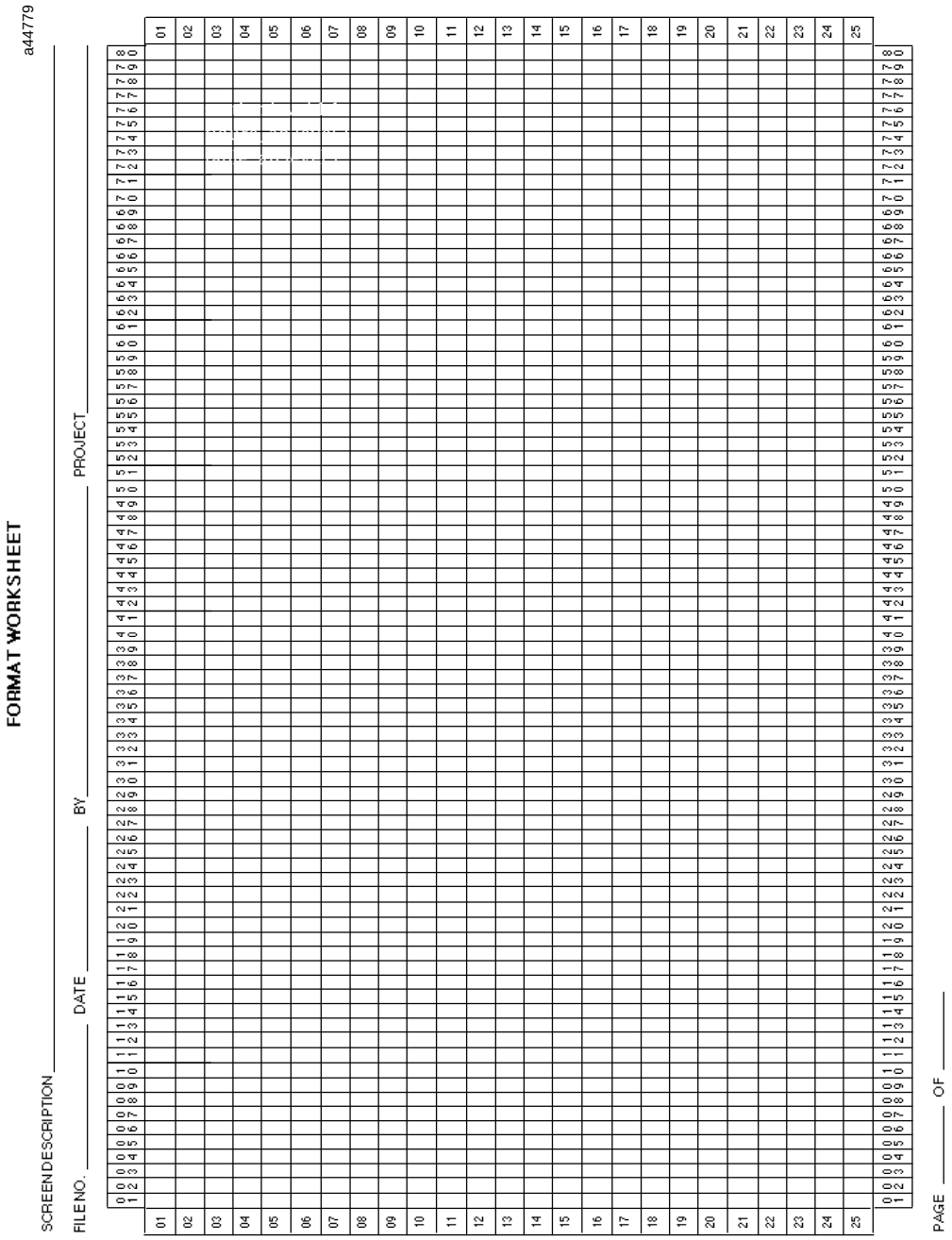


a44124



Appendix C

Screen Programming Template



Appendix D

ANSI Escape Sequences for PLCs

You may create an OptiSCREEN file with numerous blanks left for the host to fill with data. The file creation and appending procedures allow you to create the screen file using the [Ctrl]-E (ENQ, enquiry) control character for the locations on the screen where the system displays data. When you develop a screen, enter a [Ctrl]-E for each character to be filled. A blank space appears on the screen which will be filled with data.

When you use the standard screen display escape sequence ({ESC}[>nnnw where nnn specifies the screen), the system continues to place a space wherever you entered a [Ctrl]-E.

However, when you use the data file escape sequence ({ESC}[>nnnf where nnn specifies the screen), the system only processes up to the first [Ctrl]-E you entered. At this point, data received from the host in Online mode or from the keyboard in Local mode is placed on the screen instead of spaces.

As the system receives each additional character, it uses the character to fill the blanks in the file where you placed a [Ctrl]-E. As the screen file is being processed, when a character other than a [Ctrl]-E is encountered, normal file display resumes until the next [Ctrl]-E is encountered.

In the event that a non-displayable character (such as a line feed) is received in the data to be filled on the screen, the system automatically places a space on the screen for all the [Ctrl]-E characters in the same data field. A field is considered to end when a character other than a [Ctrl]-E is found in the display file. In this manner, a field of six [Ctrl]-E characters for a particular data value may use fewer than six characters and be left justified in the blanks reserved for the data.

The host or application program can terminate a data fill sequence prior to sending all of the characters required to fill the fields on the screen by sending a [Ctrl]-C (ETX, end of text) control character. In this manner, only the highest priority fields on the screen can be updated.

The format for the data fill escape sequence appears below:

{ESC} [>nnnf data1, data2, ..., datan {ETX}

The file number is nnn. The {ETX} character is optional only required if fewer data characters are sent than the blank fields in the file.

A complete list of escape codes for use with PLCs appears below. The first column contains the escape sequences. The second column contains the OptiSCREEN command descriptions. Refer to Chapter 5 for detailed descriptions of the OptiSCREEN commands.

Table D-1. Escape Sequence OptiSCREEN Command

{SOH}{STX}	'
{SOH}remark{STX}	'remark
{ESC}>nnnv<data>EOT	Append to file nnn *
{ESC}nnnm	ATTRIBUTE: nnn
{ESC}nnn;nnnm	ATTRIBUTES: nnn, nnn
{ESC}5m	BLINK
{ESC}>11l	BLINKING CURSOR
{ESC}>4h	BLOCK CURSOR
{ESC}=lll;ccca	BOX ATTRIBUTES lll X ccc
{ESC}=lll;cccd	BOX lll X ccc
{ESC}33m or {ESC}1m	BRIGHT
{ESC}43m	/ BRIGHT
{ESC}37m	BRIGHT UNDERLINE
{ESC}>98r	CLEAR KEY TABLE
{ESC}2K	CLEAR LINE
{ESC}0K	CLEAR LINE FROM CURSOR
{ESC}1K	CLEAR LINE TO CURSOR
{ESC}2J	CLEAR SCREEN
{ESC}0J	CLEAR SCREEN FROM CURSOR
{ESC}1J	CLEAR SCREEN TO CURSOR
{ESC}>5l	CURSOR or ENABLE CURSOR
{ESC}30m	DARK
{ESC}40m	/ DARK
{ESC}>99r	DEFAULT KEY TABLE
{ESC}P	DELETE CHARACTER
{ESC}M	DELETE LINE
{ESC}31m or {ESC}2m	DIM
{ESC}41m	/ DIM
{ESC}35m	DIM UNDERLINE
{ESC}>15h	Disable cursor control keys *
{ESC}>9l or {ESC}>20l	Disable auto carriage return on line feed *
{ESC}>8l	Disable auto line feed on carriage return *
{ESC}?16h	Disable display *
{ESC}2h	Disable keyboard input *
{ESC}>5h	DISABLE CURSOR or NO CURSOR
{ESC}literal	DISPLAY"literal"
{ESC}>nnnw	DISPLAY FILE nnn
{ESC}>dw	Display file directory *
{ESC}>nnnf<data>ETX	Display file nnn with embedded data, ETX is optional for terminating fill prior to completing screen *
{ESC}>nnn; nnnw	DISPLAY FILE nnn FROM BANK nnn
{ESC}>97r	Display key table *
{ESC}#3	DOUBLE SIZE TOP LINE
{ESC}#4	DOUBLE SIZE BOTTOM LINE
{ESC}15m	DOUBLE WIDE
{ESC}#6	DOUBLE WIDE LINE

* These escape sequences have no OptiSCREEN equivalent and are normally used by the host.

Table D-1. Escape Sequence OptiSCREEN Command - continued

{ESC}linB	DOWN line
{ESC}#8	E's Test - Fills screen with the letter E *
{ESC}=lin;ccce	EMPTY BOX lin X col
{ESC}>9h or {ESC}>20h	Enable auto carriage return on line feed *
{ESC}>8h	Enable auto line feed on carriage return *
{ESC}>14h	Enable echo (half-duplex) *
{ESC}>15l	Enable cursor control keys *
{ESC}?16l	Enable display *
{ESC}2l	Enable keyboard input *
{EOT}	END
{ESC}?2h	Enter VT52 mode *
{ESC}?7h	Enter wrap at end of line mode *
{ESC}4h	Enter insert character mode *
{ESC}22m	EXIT DOUBLE WIDE AND BLINK
{ESC}17m	EXIT QUAD
{ESC}10m or {SI}	EXITSUPPLEMENTAL
{ESC}4l	Exit insert character mode *
{ESC}?7l	Exit wrap at end of line mode *
{ESC}=lin;cccbchar	FILL BOX lin X ccc WITH "char"
{ESC}f or {ESC}H	HOME
{ESC}=nnn;sss;qqqh	HORIZONTAL BAR GRAPH nnn, sss, qqq
{ESC}D	INDEX
{ESC}>255u	Initialize file storage area *
{ESC}>i	INPUT PARALLELDATA
{ESC}L	INSERT LINE
{ESC}cccD	LEFT ccc
{ESC}nnnf or {ESC}nnnH	LINE nnn
{ESC}>nnntstr{ETX}	LOAD FUNCTION KEY nnn WITH "str"
{ESC}>nnn;sssr	LOAD KEY nnn WITH sss
{ESC}>10nr	LOAD KEY TABLE nnn
{ESC}nnn; nnn; nnn; s	MAKE TOUCH BOX nnn AT LOCATION nnn WITH VALUE nnn
{ESC}lin;cccf or {ESC} lin;cccH	MOVE TO lin, ccc
{ESC}E	NEWLINE
{ESC}32m or {ESC}>0m	NORMAL
{ESC}42m	/ NORMAL
{ESC}>nnno	OUTPUT PARALLELDATA: nnn
{ESC}>nnnp	PARALLELI / OMODE:nnn
{ESC}16m	QUADSIZE
{ESC}6n	Report cursor position *
{ESC}c	Reset-Alternate sequence to {ESC}z *
{ESC}m or {ESC}0m	RESET ATTRIBUTES
{ESC}#0	RESET LINE ATTRIBUTES
{ESC}r	Reset system to full screen scroll *
{ESC}z	Reset to saved power-up configuration *
{ESC}lin; cccR	Response to cursor position report *
{ESC}u or {ESC}8	RESTORE POSITION
{ESC}M	REVERSEINDEX
{ESC}7m	REVERSED
{ESC}cccC	RIGHTccc
{ESC}s or {ESC}7	SAVE POSITION
{ESC}>13h	Set hardware handshaking *

* These escape sequences have no OptiSCREEN equivalent and are normally used by the host.

Table D-1. Escape Sequence OptiSCREEN Command - continued

{ESC}>13l	Set software handshaking *
{ESC}14m	Shade (dim background, bright foreground) *
{ESC}#5	SINGLE SIZE LINE
{ESC}nnn; nnnr	SCROLL LINES nnn TO nnn
{ESC}5n	Status Report - Returns {ESC}On *
{ESC}>11h	STEADY CURSOR
{ESC}11m or {SO}	SUPPLEMENTAL
{ESC}>nnnx	Transmit file nnn out primary port *
{ESC}>dx	Transmit file directory out primary port *
{ESC}p or {ESC}0p	Transmit page (primary port) *
{ESC}1p	Transmit current line (primary port) *
{ESC}2p	Transmit character at cursor (primary port) *
{ESC}36m or {ESC}4m	UNDERLINE
{ESC}>4l	UNDERLINE CURSOR
{ESC}linA	UP lin
{ESC}=nnn;sss;qqqv	VERTICAL BAR GRAPH nnn, sss, qqq
{ESC}0c or {ESC}c	What are you - Returns {ESC}?1; 2c to indicate the terminal will operate as VT100 with Advanced Video Option *

* These escape sequences have no OptiSCREEN equivalent and are normally used by the host.

Appendix E

VT52 Escape Sequences

It is not recommended that VT52 escape sequences be used with new application software.

The first column in the following list contains the character or characters that follow the escape character, and the second contains the function of that sequence.

SEQUENCE	FUNCTION
#	Transmit Page.
/ Z	Response to ESC Z (VT100 identification code for VT52).
<	Enter ANSI mode.
@	Enter insert character mode.
A	Cursor up.
B	Cursor down.
C	Cursor right.
D	Cursor left.
E	Clear screen (except status lines).
F	Enter graphics mode.
G	Exit graphics mode.
H	Move cursor to home position.
I	Reverse index (reverse scroll).
J	Erase from cursor to end of screen.
K	Erase from cursor to end of line.
L	Insert a line at cursor position.
M	Delete line at cursor position.
N	Delete character at cursor.
O	Exit insert character mode.
P	Special function key "f1" (transmitted only).
Q	Special function key "f2" (transmitted only).
R	Special function key "f3" (transmitted only).
S	Special function key "f4" (transmitted only).
T	Special function key "f5" (transmitted only).
U	Special function key "f6" (transmitted only).
V	Special function key "f7" (transmitted only).
W	Special function key "f8" (transmitted only).
Y <line#><col#>	Cursor addressing. Line and column numbers are single ASCII characters where ASCII code 32 decimal is used to designate line or column one and increase from there.
Z	Identify as VT52. Response: ESC / K.

SEQUENCE	FUNCTION
^	Transmit status line(s).
	Transmit current (cursor) line.
(underscore)	Transmit character at cursor.
b	Erase from beginning of display to cursor.
c	Enable clock display.
d	Disable clock display.
e	Send time to host (Transmits HHMMSS<CR>).
j	Save current cursor position.
k	Restore current cursor position.
l	Erase entire line.
n	Cursor position report.
	Response: ESC Y <line #> <col #).
	See cursor positioning notes above.
o	Erase from beginning of line to cursor.
p	Enter reverse video mode.
q	Exit reverse video mode.
v	Enter wrap at end of line mode.
w	Exit wrap at end of line mode.
x<parameter>	VT52 set modes.
x4	Set block cursor.
x5	Disable cursor.
x8	Enable auto line feed on carriage return.
x9	Enable auto carriage return on line feed.
x;	Set non-blinking cursor.
x=	Set hardware handshaking.
x>	Enable ECHO (half duplex).
y<parameter>	VT52 reset modes.
y4	Set underline cursor.
y5	Enable cursor.
y8	Disable auto line feed on carriage return.
y9	Disable auto carriage return on line feed.
y;	Set blinking cursor.
y=	Set software handshaking.
y>	Disable half duplex.
z	Reset to power up configuration.
(	Enable keyboard.
)	Disable keyboard.

Appendix F

Function Key Operations

The 16 function keys are programmed to perform two independent functions. In Local mode, they are used as single key entries to select various character and line attributes allowing user screens to be programmed easily. In On-Line mode, they transmit the escape sequences shown for the VT52 mode or the currently programmed messages for the ANSI mode.

In the ANSI mode, the function keys transmit user-defined messages which may include other escape sequences. These messages may contain up to 16 ASCII characters. The default messages (escape sequences) for the ANSI mode or the standard VT52 messages (escape sequences) will be ignored upon receipt by the terminal.

To program new ANSI messages, the escape sequence ESC [> n t followed by the message and terminated with ETX (Control-C) is used. This escape sequence can be entered while in Local mode or On-Line mode. The terminal will truncate any programmed messages at 16 characters, and will fill any unused character locations up to 16 with NULLs. These escape sequences may be programmed as part of a screen file.

In On-Line mode, the function keys are not preprogrammed.

In Local mode, the function keys have been preprogrammed to perform specific tasks. These are as follows:

f1 = Reset to normal video display (resets attributes marked with *).
f2 = Select foreground intensity / color *.
f3 = Select background intensity / color *.
f4 = Terminate an f2 or f3 selection.
f5 = Enter blink video *.
f6 = Enter reverse video *.
f7 = Enter double wide character mode *.
f8 = Exit blink and / or double wide mode.
f9 = Enter quad size character mode.
f10 = Exit quad size character mode.
f11 = Set line to double high tops & double wide.
f12 = Set line to double high bottoms & double wide.
f13 = Set line to single high & single wide.
f14 = Not used.
f15 = Not used.
f16 = Clear all attributes -
Includes video attributes and line attributes.
Exits supplemental graphics.
Exits quad size characters.

The function keys f2 and f3 are used in a sequence such as f2 n f4 or f3 n f4. These keys allow any combination of foreground and background intensities to be combined. They are also designed to be upward compatible with color models of the terminal. The parameter n yields the effect shown in the following table.

n	MONOCHROME	NOTES
0	Hidden(Black)	Defaultbackground
1	Dim \	
2	Normal	Defaultforeground
3	Highlight \	
4	---- \	
5	Underline&Dim \	
6	Underline & Normal \	
7	Underline&Highlight \	

Note

Underline is a foreground attribute only.

The attribute ”shade” described earlier is the combination of a dim background and highlight foreground. It can be achieved using the sequence: f2 3 f4 followed by f3 1 f4. Obviously many other versions of shade can be created using the above parameters. Reverse in monochrome automatically switches the foreground and background intensities. In the color mode, reverse will only switch parameters 0 to 3.

Appendix G

STR-LINK III Communications Protocol

Backup of user memory from the Mini OIT using a STR-LINK III digital tape recorder must be performed at 4800 baud or less. The serial port may be configured as either the primary or secondary port, but must use 8 bit, no parity.

IBM Utility programs supplied with Release 2.1 or later of the full size OIT may be used with the Mini OIT, and the standard baud rate of 9600 will work properly.

Experienced programmers may wish to use a personal computer or other device to back up user memory instead of a STR-LINK III Digital Cartridge Recorder. The following outline shows the protocol used by the Mini OIT during Save, Load, and Verify operations.

STEP	Mini OIT TRANSMITS		STR-LINK III	TRANSMITS
1	DC1(11H)	Reader On		
2			ACK(06H)	Acknowledge
3			User Memory *	
4	DC3(13H)	Reader Off		
5			ACK(06H)	Acknowledge
6	EOT(04H)	Rewind		
7			ACK(06H)	Acknowledge

* For releases prior to 2.0, one character per byte of memory is transmitted. (If 16K memory, then 16,384 characters will be sent).

For releases 2.0 and later, a 4-byte header is transmitted for each memory block used, plus the characters, plus a zero at the end of all data. The 4-byte header for each memory block includes the following:

Byte 1: # of K-bytes in memory block (in packed BCD format).
Byte 2 & 3: # of bytes in memory block (in binary).
Byte 4: Memory block type code (in binary).

The Memory block type code is as follows:

Block type 0 = Screen memory.
Block type 1 = Basic program memory.
Block type 2 = Basic data memory.
Block type 3 = Back-up screen memory.
Block type 4 = Back-up program memory.
Block type 5 = To be defined.

STEP	Mini OIT TRANSMITS		STR-LINK III	TRANSMITS
1	DC2(12H)	Punch On		
2			ACK(06H)	Acknowledge
3	SO (0EH)	Shift out		
4	User Memory *			
5	SI(0FH)	Shift in		
6	DC4(14H)	Punch Off		
7			ACK(06H)	Acknowledge
8	EOT(04H)	Rewind		
9			ACK(06H)	Acknowledge

*If 16K memory, then 16,384 characters will be sent.

A 250ms delay prior to step 5 (SI) is used to differentiate this as a valid command from possible data equal to 0FH.

A

AC Power, 3-2

ALTERNATE {ESC}[12m, EXit ALTERNATE {ESC}[13m, 5-8

Alternate Graphics Set, B-7

Apostrophe (') Comment, 5-3

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